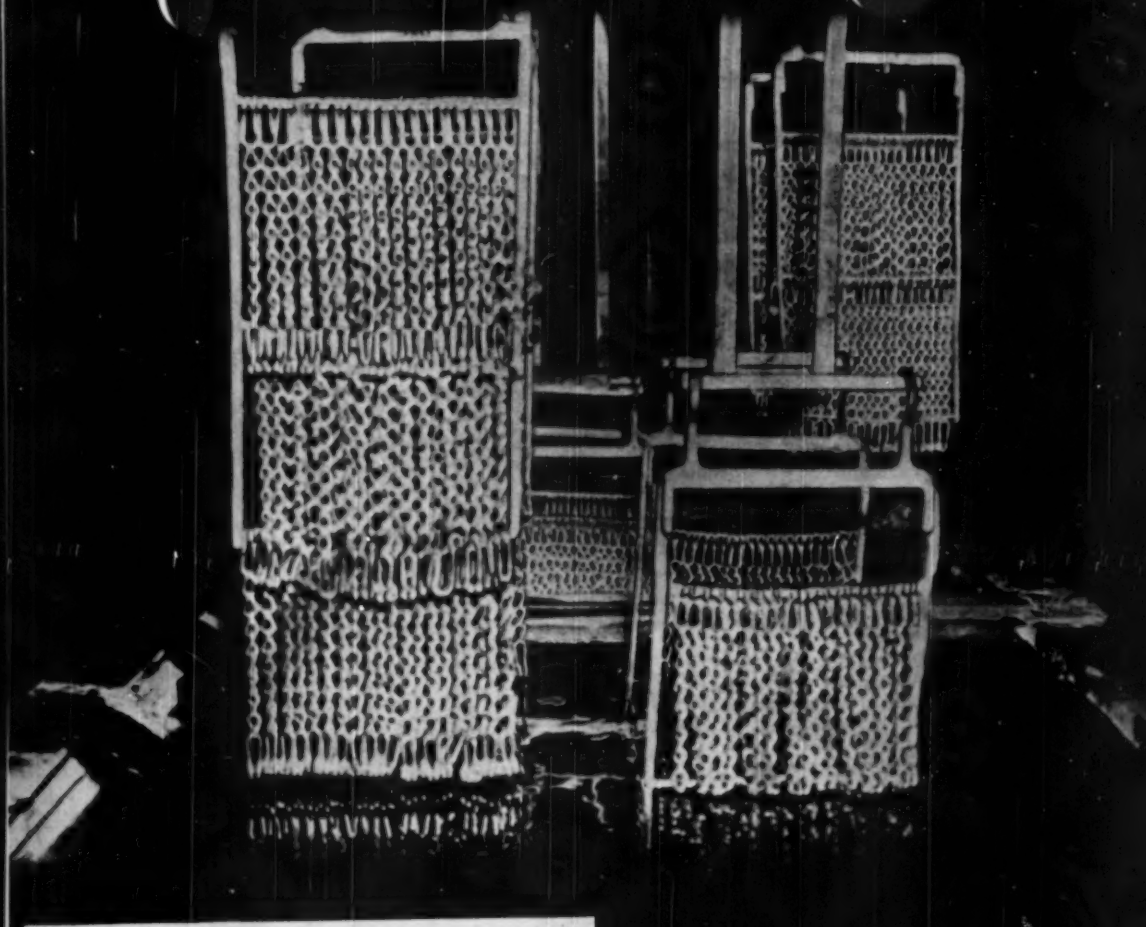
VOLUME 36
NUMBER 4

APRIL, 1949

plating



MANUFACTURE
OF AUTO TIRE CHAINS

See Contents Page 337

DO YOU USE
ANODIC OR CATHODIC CURRENT
When You Electroclean DIE-CASTINGS

WHETHER YOU USE ONE OR THE OTHER SATISFACTORY RESULTS ARE ASSURED WITH THE USE OF THE PROPER CLEPO COMPOUNDS.

A controversy has existed for some years relative to whether blistering of electroplate could be caused by cathodic or anodic current cleaning. The Clepo Laboratories have conducted exhaustive tests along these lines, and from this data have developed two new and effective Clepo Electro-cleaners. Either can be used prior to copper — nickel — chromium plating and no blisters will develop if Electroplated parts are baked.

Clepo 51-H is designed for use with cathodic (direct) current; 4 to 6 volts potential and a concentration of from 4 to 6 ounces per gallon, and a temperature of 170 degrees to 190 degrees Fahrenheit. The cleaning time will be from 10 to 60 seconds — the exact time being determined by the amount of soil to be removed.

Clepo 50-K is compounded for cleaning with Anodic (reverse) current; 5 to 6 volts potential in a concentration of 4 to 6 ounces per gallon and a temperature of 170 degrees to 190 degrees Fahrenheit.

For complete information on preparation of Die-Castings prior to Electroplating, write on your firm letterhead for new Clepo Circular ZB-1.

FREDERICK GUMM Chemical Company Inc.

538 FOREST STREET, KEARNY, N. J.

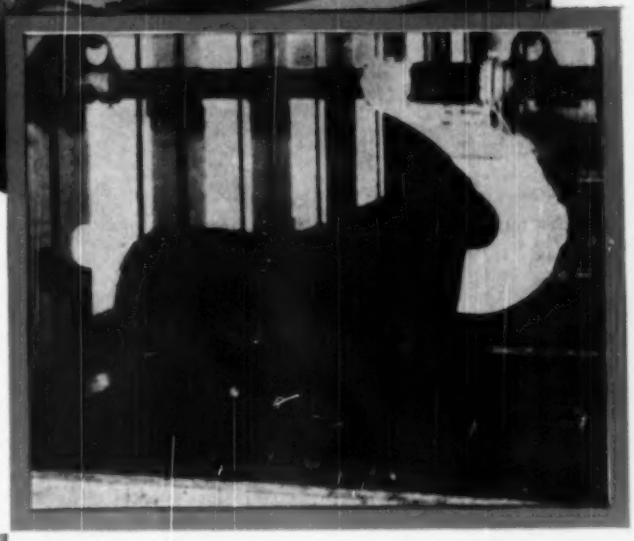
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 299.

ENTHONE

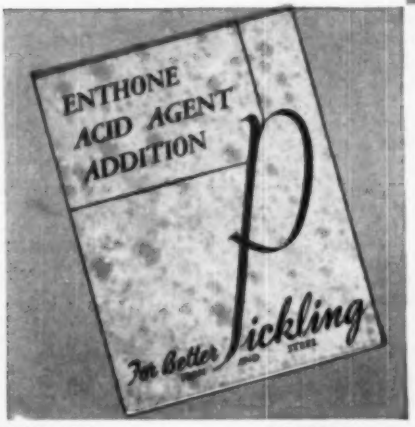
Acid Addition Agent

TRAPS FUMES

Blanket of Foam



THESE *Before and After pictures* show the results you can obtain by using Enthone Acid Addition Agent. The health of the worker is safeguarded, corrosion on surrounding buildings and finished steel is reduced, and an acid drag-out saving of twenty percent is obtained.



Send for this informative bulletin giving step-by-step details for better pickling

OTHER AIDS FOR BETTER PICKLING

Inhibitor 7 C – a low-priced, complete inhibitor for hydrochloric acid.

Inhibitor 9 – a new type of inhibitor for hydrochloric, sulphuric, hydrofluoric or other non-oxidizing acids. A complete inhibitor that is free-rinsing and leaves the metals bright.

ENTHONE INC.

442 ELM STREET, NEW HAVEN, CONNECTICUT

Based on the experience of many plating plants, here's a prescription that will give you *really* clean steel parts that are always ready for automatic plating operations with negligible rejects.

1. Clean *cathodically* with Magnus 94XX for 1-2 minutes.
2. Rinse.
3. Clean *anodically* with Magnus 61XX for 1-3 minutes.
4. Rinse.
5. Acid Dip.
6. Rinse.
7. Plate.

In plant after plant this procedure has cut rejects due to poorly cleaned surfaces by 75-95%, and has improved the over-all quality of the plated job.

ASK US FOR COMPLETE DETAILS.

MAGNUS CHEMICAL COMPANY • 41 South Ave., Garwood, N. J.

In Canada—Magnus Chemicals, Ltd., 4040 Rue Masson, Montreal 36, Que.

Service representatives in principal cities

IN METAL CLEANING IT'S **Magnus**

CLEANERS • EQUIPMENT • METHODS

Industry News

Diamond Alkali Company's New Technical Service Division, headed by Walter C. Bates, Manager, and Dr. George F. Bugar, Assistant Manager, is designed to cover all phases of service work connected with the sale and use of Diamond-made alkalies, co-products and derivative specialty chemicals. An integral part of the research-development organization located at the company's Painesville plant, it will function as a separate unit manned by a staff of 21 technical people recruited from the company's Pure Calcium Products Division Technical Staff, the Research Product Development Group, and the Sales Department in Cleveland. Its two main functions include such allied responsibilities as quality control changes, modification of materials, exploration and development of additional uses for existing products, discovery of applications for new products, market analysis and sales promotion of chemicals in pilot-scale or initial-production stages, and preparation of technical literature on new or improved products.

Manager of the company's Pure Calcium Products Division since 1935, Bates, upon joining the company in 1929, supervised the design and construction of the Standard Chromate Division's plant at Painesville. Later he was transferred to Diamond's Standard Silicate Division, then located in Pittsburgh, where he was engaged for three years in the marketing and manufacture of crystalline silicates of soda for detergent purposes.

Dr. Bugar, the new assistant manager of the Diamond Technical Service Division, joined the company in 1944 as Product Development Manager in the Research and Development Department following 15 years with the Hooker Electrochemical Company, Niagara Falls, N. Y., where he served successively in various research, new product development, sales promotion and advertising capacities.

New Test Instrument Company. James W. Dice, formerly with Westinghouse and more recently Assistant Sales Manager of Sperry Products, announces the formation of a new sales and development organization to be known as **J. W. Dice & Company** with headquarters at Grand View-on-Hudson, N. Y.

The new company is specializing in the marketing of industrial and laboratory

Published monthly at 5000 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916. Copyright, 1949, by the American Electroplaters' Society, Inc. Subscriptions: Domestic and Canada, $4.00 per year, 50c per copy; Foreign, $6.00 per year, 75c per copy.

Burnishes Better and FASTER

Features

Patented bearing construction assures smooth running — No vibration even with capacity load.

Direct Drive — No belts. Gears fully enclosed.

Motor mounted on top, out of the way — Stays dry — Easily accessible.

Accurately balanced for easy tilting.

Self-sealing cover of light-weight aluminum.

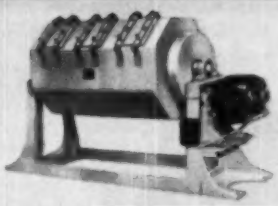
Spring-pressure ratchet lock, released by handy foot lever, holds barrel securely at any angle.

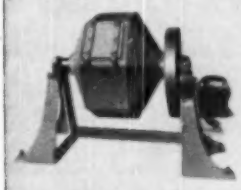
Hard maple lining — easily removable.

Three standard sizes.

DEBURRING BARRELS

3 - compartment barrel can be used for three different deburring jobs at one time. This model is also available with 1, 2 or 4 compartments.





Triple-Action Deburring Barrel for very fast cutting. Specially shaped sides greatly increase tumbling action and reduce deburring time. Ideal for removing heavy burrs and smoothing extremely rough surfaces.

SAWDUST DRYING BARREL

Combination Steam-Heated Sawdust Barrel and Separator. The winning combination for maximum efficiency. Dries the work quickly, leaving it bright and spotless, and separates it from the sawdust without handling.

BELKE *Better-Built* BURNISHING BARRELS

The Modern Low-Cost Method of burnishing stampings, die castings, machined parts and other small pieces. Produces more uniform work with less rejects, and requires less space and labor.

Heavy, welded-steel frame and base affords absolute rigidity. Will not warp or twist when used on rough or uneven floors. There are no protruding feet or braces to interfere with the operator. Patented radial and thrust bearing construction assures that the balls always run in a perfect race regardless of the position of the barrel, providing smooth, long wearing operation.

Write for additional information today or ask to have a BELKE Engineer call and help you select the proper barrel and tumbling compound to do your job most efficiently.

Belke

MANUFACTURING CO.

947 North Cicero Ave. • Chicago 51, Ill.

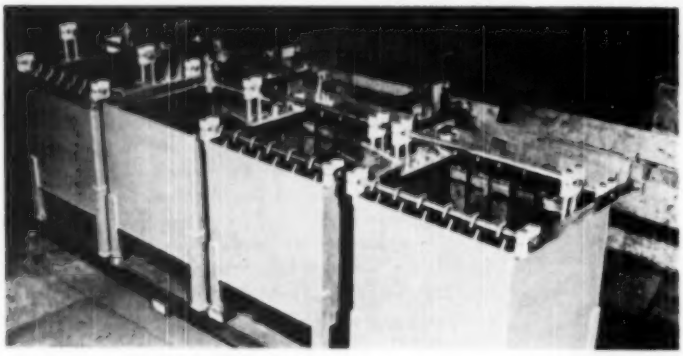
EVERYTHING FOR PLATING PLANTS

Maintenance costs drop when you specify

STORTSWELDING

Many Stortswelded plating tank cycles operating under severest corrosion conditions have lasted without maintenance far longer than was anticipated by the men who designed them.

Specializing in high quality welding of all metals and alloys is the basis of operations in fabricating tanks for utmost utility and lasting satisfaction. Thus welds in all locations are made to be equal to or even better than the base metal in strength, in effective section and in corrosion resistance. The same skillful and specialized weldmanship is applied to all details and accessory items when Storts is entrusted with the fabrication and installation of a complete tank cycle, ready to go to work, as illustrated below. On this order Storts furnished plain and lead-lined tanks, copper anode bars and bus bars, steel anodes and lead anodes. In this typical example of Storts service to the plating industry, one order and one responsibility covered a multitude of details—and assured the customer of sustained performance.



Get our quotation on your next requirement for single tanks, complete cycles or replacements.

STORTS WELDING COMPANY
INCORPORATED
42 Stone Street Meriden, Conn.

Manufacturers of Welded Fabrications to Specifications

Industry News

non-destructive test instruments employing magnetic, electronic, ultrasonic and radiation principles. Marketing rights have been obtained for a number of test instruments manufactured here and abroad, and other specialized test devices are under development by the company.

F. T. C. Charges Against Brush Plater. False and misleading advertising of an electroplating device designated "Warner Brush-Electroplater" is charged in a complaint recently issued by the Federal Trade Commission against Warner Electric Company, Chicago, and its officers.

The complaint alleges that advertisements disseminated by the corporation have represented, contrary to fact, that the appearance, quality and durability of objects plated by use of the "Warner Brush-Electroplater" will equal the results obtained by using the conventional tank method.

Over a period of some years the Chicago Better Business Bureau is said to have received several complaints from purchasers that the equipment will not produce results predicted by its advertised description.

The recently issued F. T. C. complaint avers that advertisements of the corporation have falsely represented that it is easy and simple to plate metal objects with chromium, copper, silver, nickel or other metals by the Warner method of electroplating; that a person does not have to be a skillful operator or have special knowledge of the electroplating process in order to obtain satisfactory plating results by the use of the device; that worn articles can be replated with a durable sparkling coat of metal by a stroke of the electroplating brush; that the method will chromium plate an article; that the method plates equally well on smooth or rough, flat or round surfaces and in deep recesses and on irregular shapes; that by doing work for others the device will pay for itself in one week; that a complete set of tools and equipment necessary for satisfactory electroplating is furnished purchasers of the device; that the brush method of electroplating is new and that the company and its officers are owners of a design or process patent which entitled them to exclusive use of the method.

The corporation and its officers have filed answers denying the charges.

The Assets of the Roll Forming Company, Fullerton, Calif., manufacturer of tubular chromed steel furniture distributed under the trade name of "Ballboa", have been purchased by **ATF Incorporated,** Elizabeth, N. J., the parent company of the **Daystrom**

Cowles SM CLEANER

A Non-Foaming Cleaner for-

1. • • • use as an electrocleaner (cathodically, anodically) on steel when exceptionally high current densities, tank design or type of work tend to produce excessive foaming.

2. • • • use as a detergent in all types of washing machines for die castings, steel, brass and copper.

Because it is formulated with water conditioners, Cowles SM Cleaner is especially effective under hard water conditions.

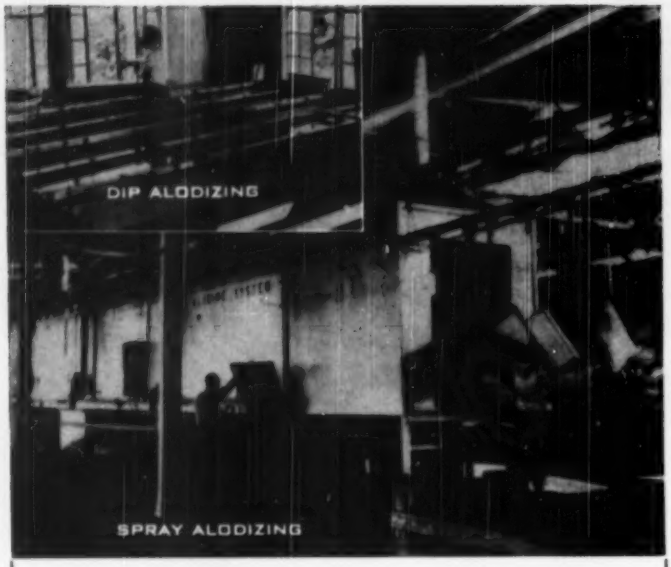
PROMPT SHIPMENTS FROM CONVENIENT WAREHOUSE STOCKS

• • • • ***COWLES TECHNICAL SERVICE***
gladly furnished upon request

Cowles Chemical Company

METAL CLEANER DEPARTMENT

7016 EUCLID AVENUE CLEVELAND 3, OHIO



Alodized®
ALUMINUM
PROVIDES THE UTMOST IN METAL AND FINISH PROTECTION

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING
- Granodine ®
- Durodine ®
- Alodine ®
- Lithoderm ®
- Thermal Granodine ®

RUST REMOVING AND PREVENTING
- Deoxidine ®
- Peralux ®

PICKLING ACID INHIBITORS
- Rodine ® *®

Coating Facts

"ALODINE" forms a skin-like coating firmly embedded in the aluminum. This protective skin is thin, tough and tight. It is extremely resistant to corrosion. It bonds paint firmly to the metal for the life of the finish.

Process Facts

ALODIZING® is simple, quick, economical, easy to use, and effective. "ALODINE" can be applied by dipping, spraying, or brushing the work. It can be used to advantage in your own production. For details, write or call Ambler 0486—for a descriptive folder on "ALODINE".

*"ALODINE" Trade Mark Reg. U. S. Pat. Off.

Pioneering Research and Development Since 1914

AMERICAN CHEMICAL PAINT COMPANY

AMBLER, PA.

Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

Industry News

Corporation, chromed steel furniture manufacturer with plants in Olean and Friendship, N. Y., and other companies.

The present management will be continued under the direction of ATF Incorporated. The Roll Forming Company employs approximately 170 persons and utilizes 35,000 square feet of floor space for manufacturing.

The Chromic Acid Situation. The Masters' Electroplating Association, 123 William Street, New York 7, N. Y., in its Monthly Bulletin for January, notes that "outside market" chromic acid is now being offered at steadily reduced prices, still above the list price of regular suppliers but lower than they have been in the past. It is evident that increased production of chromic acid is having its effect in narrowing the gap between supply and demand.

Plating Shop Robberies. According to the same source a considerable number of New York City job plating shops have been broken into and robbed of anodes, chemicals, and cash. Not less than four shops were thus visited between December 24 and January 22, namely Mastercraft Novelty Company, Philip Sievering, Inc., Suffolk Silver Company, and Spectranome Plating Company. Users of plating supplies should advise the police when offers are made under suspicious circumstances.

Lea Manufacturing Company of Canada, Limited, has been formed to manufacture and distribute the extensive line of Lea polishing, buffing and burring compositions. Everything made in the Canadian plant is manufactured to original Lea specifications and under the guidance of the technical staff of The Lea Manufacturing Company of Waterbury, Conn.

Officers of the new Canadian company include: Dr. Henry L. Kellner, President; Earle W. Couch, Vice-President; and Kergan Wells, Secretary and General Manager. Factory and office are at 370 Victoria Street, Toronto 2, Ontario.

Canadian distributors are: **Alloycraft, Limited,** 27 Hillside Avenue, Westmount, Montreal, Quebec; **British-American Chemical Company, Ltd.,** 789 W. Pender Street, Vancouver, B. C.; **Thomas & Son Company,** 16 Walnut Street North, Hamilton, Ontario; and **W. W. Wells, Ltd.,** 370 Victoria Street, Toronto.

New G-E Apparatus Service Shop for Seattle. A new and greatly expanded apparatus service shop, replacing one established in 1923, was officially opened in Seattle on January 15 by General Electric's Apparatus Department. It

IS YOUR PLATING BATH SICK?

Get to the Heart of the trouble and cure it with

THE 5 MINUTE HULL CELL TEST!

TWO MODELS—with Filtered Output Rectifier for 110 Volt A.C. Current:

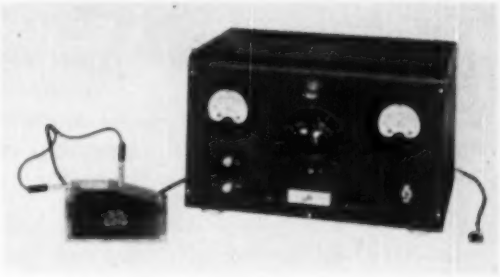
MODEL B-267 (for Hull Cell only) gives 5 amps. —0 to 15 Volts

MODEL B-1000 (for Hull Cell and General Laboratory use) gives 30 amps. —0 to 10 Volts, and 5 amps. —0 to 18 Volts

SIMPLE • EASY • ACCURATE

The HULL CELL is the PLATER'S Stethoscope!

1. CHROMIUM—Sulfate or Fluosilicate types
2. BRIGHT NICKEL—Cyanide to Zinc Ratio, Impurities, Composition
3. ZINC—Cyanide to Zinc Ratio, Impurities, Composition
4. CADMIUM—Brightener, Impurities, Composition
5. BRASS—Color Control
6. COPPER—Free Cyanide, Plating Range, Impurities



?

Have you tried NO-CRO-MIST, the remarkable agent for chrome that cures the fume problem? Many plants report that NO-CRO-MIST costs nothing to use because of chromic acid sevings . . . Extra dividends are freedom from chrome contamination of the air, cleaner and better operation!

?

Have you tried ROHCO 20XL, the superb new cadmium brightener? If you think your cadmium is good, you will be amazed at the improvement in appearance and better operation of your baths when you try ROHCO 20XL. All these advantages at LOW COST!

WRITE TODAY for Complete Information!

ROHCO

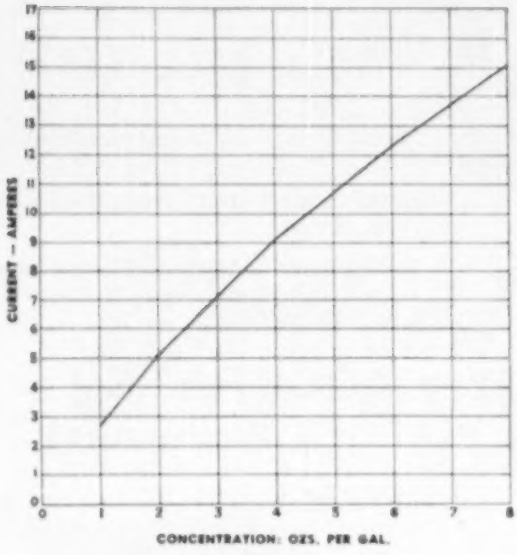
R. O. HULL & COMPANY, INC.

1277 West Third Street • Cleveland 13, Ohio

"YOUR PLATING IS BEST WITH THE HULL CELL TEST"

For faster cleaning of ferrous parts— WYANDOTTE F.S.

Current-conducting Characteristics of Wyandotte F.S.
(Steel Electrodes, 6 Volts, 180° F.)



Wyandotte F.S. is a heavy-duty reverse-current electrocleaner, especially designed to remove fabricating compounds and "smut" from ferrous parts prior to plating.

Because F.S. is a *balanced* formulation, it assures (1) high conductivity—see chart above, (2) fast and complete wetting and cleaning action, (3) controlled foaming and (4) long life in solution.

Your Wyandotte Representative will be glad to demonstrate the advantages of Wyandotte F.S. or any other Wyandotte Metal Cleaner at your convenience. He's always at your service.

Wyandotte
REG. U. S. PAT. OFF.

WYANDOTTE CHEMICALS CORPORATION
WYANDOTTE, MICHIGAN • SERVICE REPRESENTATIVES IN 88 CITIES

320 FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 243.

Industry News

is one of the most modern in the Company's coast-to-coast chain of 29 service shops, according to J. R. Murphy, G. E. Apparatus Department Manager for the Northwestern District. The new Seattle facilities, he said, are staffed by factory-trained engineers and technicians to give round-the-clock service, 365 days a year, to users of motors, turbines, generators, controls, and similar electric apparatus.

Harry W. Siebert, for many years superintendent of the old Seattle Service Shop, will continue in this capacity, with C. E. Simonds as assistant superintendent.

Masters' Electroplating Association of New York City held its annual banquet in the Henry Hudson Hotel on January 22. The affair was attended by one hundred and thirty members and their families.

Following a cocktail hour, dinner was served at 8:00 P. M. After an address of welcome by the chairman, Mr. Julian Nelkin, the Association's Award for Meritorious Service, an engraved gold-plated bronze plaque, was presented to the Cohand-Epner Company and accepted for the firm by Mr. Gerald Epner.

A demonstration by the American Square Dance Group and a try at square dancing by the guests, preceded the conventional dancing which continued until midnight. A good time was had by all.

The following were elected to the Executive Committee at the annual meeting:

Irving Berkman, Berkman Brothers
John J. Fannon, Muller Art Plating Works
Frank Kaiser, Long Island Mechanical Plating Company
Leonard A. Kornblum, Kings Electro-Plating Company
Julian Nelkin, Henry Nelkin, Inc.
Sidney Rosenthal, National Chromium Corporation
Philip Sievering, Jr., Philip Sievering, Inc.

Flurey Products Corporation, 450 Seventh Avenue (Suite 3500), New York City, has recently been organized by Robert Corey and Benjamin S. Flug to engage in the sale of a complete line of products for the polishing and plating trades, and to render complete plant-layout and engineering service. Both men were previously associated with the Bart-Messing Corporation.

Mr. Corey had extensive experience in plating room problems while with the Union Polishing and Plating Corporation of Rochester, N. Y. Mr. Flug, a graduate chemist, was formerly with the Calco Chemical Division of the American Cyanamid Corporation and with the Radford, Va., branch of the Hercules Powder Com-

EVERY representative of Green Electric rectifiers also represents a manufacturer of motor-generators. We feel that these companies are qualified to tell you which type of power supply best meets your needs.

A. J. LYNCH
2424 Enterprise Street
Los Angeles 21, Calif.

MUNNING and MUNNING
202 Emmet Street
Newark 5, N. J.

CROWN RHEOSTAT and SUPPLY COMPANY
3465 N. Kimball Ave., Chicago 18, Ill.

FREDERIC B. STEVENS, Inc.
1800 18th Ave.
Detroit, Mich.

W. GREEN ELECTRIC COMPANY, INC.

GREEN EXCHANGE BUILDING • 130 CEDAR STREET • NEW YORK 6, N. Y.
RECTIFIER (G) ENGINEERS

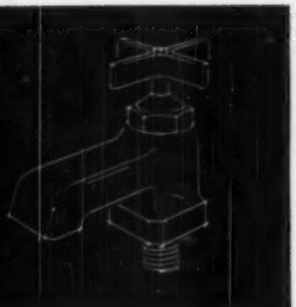
If you are...

GRINDING

POLISHING

OR FINISHING

FLAT OR



CONTOURED SURFACES

CAST PIECES

STAMPED PIECES

OR FORGED PIECES

Here are 7 reasons why the back-stand belt method is best for you . . .

1. The coated abrasive belt cuts cooler, faster than the old set-up wheel because of the longer interval between work contacts.
2. Inexperienced help can be quickly trained to operate a back-stand belt machine—freeing highly skilled personnel needed to set-up the wheels.
3. It takes only a few seconds to change an abrasive belt.
4. Temperature-controlled room for curing set-up wheels can be released for more productive uses.
5. Factory coating by a scientifically controlled process makes possible uniform grit distribution, provides a tough, sharp, fast cutting abrasive tool which assures smooth, even finishes.
6. Versatile contact wheel used with back-stand belt gives added efficiency in grinding and finishing flat and curved surfaces, and permits smooth even grinding action.
7. Production is increased because the grinding time per unit is greatly reduced.

And remember the back-stand method is a fast, economical and efficient process that can be installed at reasonable cost without discarding your polishing jack.

MAIL THIS COUPON TODAY

Please send me the booklet:
"Facts About Back-stand Belt Grinding and Polishing."

Name _____ *Title* _____

Firm _____

Address _____

City _____ *Zone* _____ *State* _____

We recommend buying through your Industrial Supply Distributor

ARMOUR *Coated Abrasives*

Armour and Company • 1355 W. 31st Street • Chicago 9, Illinois

99-ZINC gives improved

CURRENT DENSITY • PLATING RANGE • EFFICIENCY

A Complete Balanced Electrolyte!

FOR GREATER PERFORMANCE demand Promat No. 99 zinc. This firmly established bath combines quality with speed and high efficiency. No. 99 zinc solution can be operated at current densities as high as two hundred amperes per square foot, in still tanks and semi or full automatic machines, with deposits of fine grain structure and uniform high brilliance. Promat No. 99 zinc is also unexcelled for barrel plating, offering unusual speed of deposition and fine color.

Promat No. 99 zinc consists of concentrated and purified make-up and maintenance materials together with PROMAT C-42 addition agent, which aids in producing the characteristic high efficiency and brilliance of the bath, and PROMAT DOCTOR SOLUTION, which maintains its purity and freedom from heavy metal contamination.

PRO-SEAL

Chrome protect your zinc plated products and at the same time produce a brilliant finish easily and quickly. Can be used following the Promat No. 99 zinc plating process or to treat any pure zinc surface. Uses no current. Can be hot rinsed or oven dried. Simple to control and very economical. Pro-Sealed zinc plating meets specifications for appearance and salt spray resistance which enable it to replace scarce, costly or unobtainable pre-war finishes. Pro-Seal is widely used in the finishing of products where high corrosion resistance is demanded by rigid specifications.

The value of durable brilliant zinc is obvious. Manufacturers of cabinet and refrigerator shelving, wire goods, hardware, automotive parts and hundreds of other products can use Pro-Seal on zinc to great advantage.

Send us your own sample, which we will gladly process and return promptly.

For further information write to

PROMAT DIVISION, Poor & Company
851 SOUTH MARKET STREET, WAUKEGAN, ILL.

Industry News

pany. Subsequently he was employed as plating superintendent of the Grand Rapids Brass Company of Michigan.

New G. E. Service Shop-Warehouse in Salt Lake City with greatly expanded facilities for service on General Electric apparatus in the states of Utah, Idaho, Montana, and Nevada will be established by the G-E Apparatus Department. J. A. McDonald, superintendent of the present shop, and J. C. Davis, warehouse supervisor, will continue in their positions in the new building.

Development of Safety Equipment for all industries will be undertaken in a new four-story, 24,000-sq.ft. laboratory, the largest of its kind in the world, to be built in Pittsburgh by Mine Safety Appliances Company for completion in September. The building, to be located one block from the company's Pittsburgh plant, will be dedicated as a memorial to John T. Ryan, who, with Mr. Deike, founded Mine Safety Appliances Company thirty-five years ago. It will be known as the John T. Ryan Memorial Laboratory.

Dust, fume and gas chambers for research on masks and protective respirators and an electron microscope to explore the nature and behavior of dust particles and the fibrous materials used for filtering them are among the special equipment to be installed. Activities of the Physical Laboratory include development of instruments to detect flammable, toxic and noxious gases and dusts in many different fields, and in the Chemical Section, researchers will continue to develop chemicals to remove toxic and noxious fumes and gases from the atmosphere in mines and industrial plants. The Rubber and Plastics Laboratory will study materials for manufacturing face masks, safety hats and helmets, safety clothing and other types of equipment.

Dr. William P. Yant, Director of Research and Development for the company since 1936, will have charge of the research laboratory.

Metalwash Machinery Corporation's New Michigan Office is located at 6432 Cass Avenue, Detroit, Mich. Mr. Webb L. Nimick, who will be in charge of this office, will be available for consultation and information regarding all types of metal cleaning equipment.

A graduate of Yale University, he has heretofore been in the Metalwash main office in Irvington, N. J., where, as an engineer, he has been working on the development and design of metal parts washing, pickling, drying, and processing equipment.

Chicago Electroplaters Institute, the local job platers' organization in Chicago, held its 14th Annual Meeting on January 20. The following were elected officers for 1949: Chairman, J. P. Mahody, Western Rust Proof Company; Vice-Chairman, J. Robert Greenwell, Chrome-Rite Company; Secretary-Treasurer, Theron De Mott, Acme Electro-Plating Company.

Directors for 1949 are Herbert E. De Grenier, Grand Plating Company; Gilbert F. Holmgren, Apex Plating Company; and George Westerberg, Jr., Mechanical Plating Company; and for 1950: John J. Bognar, Metal Processing Company; Louis P. Lanz, Northwestern Plating Works; Louis Presecky, Quality, Inc.

The new Chairman, J. P. Mahody, complimented the retiring chairman, Mr. W. O. Zinn on his untiring efforts in behalf of the Institute and on his continuing activities with the National Association of Metal Finishers, of which he is Director and Secretary.

The fifty-seven representatives of the enameling and plating jobshops of Chicago then devoted themselves to renewing old friendships and enjoying an evening of relaxation and entertainment.

Elgin Softener Corporation, Elgin, Ill., and **Illinois Water Treatment Company,** Rockford, Ill., have joined forces to provide a better, more complete water-conditioning and de-mineralization service at minimum cost to the user. The already comprehensive line of Elgin zeolite softeners, filters, water treating chemicals, and boiler- and process-water conditioning systems will be supplemented by the Ilco-Way products, and fully rounded out by the addition of Ilco-Way deionizers, de-alkalizers, de-mineralizers and special ion-exchangers.

Each company will maintain its name identity and personnel, but through con-

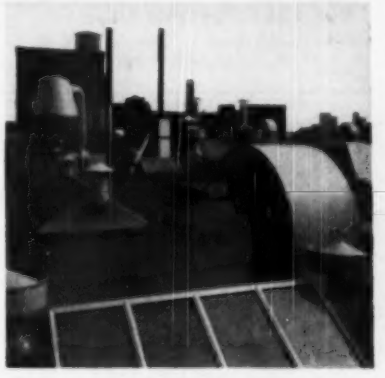
Is METAL PARTS CLEANING a bottleneck in your plant?
DEGREASERS
WASHERS
DRYERS
A complete line of OPTIMUS Equipment is available in standard and special sizes to meet every metal parts cleaning problem and allied processing applications.
OPTIMUS VAPOR DEGREASERS are available in all various types and stages, straight vapor, vapor-spray, liquid-vapor and combinations of these. All sizes from simple batch type degreasers to custom built monorail or cross rod conveyor models.
OPTIMUS METAL PARTS WASHERS — single or multiple stage — screw or conveyor, mesh belt or monorail types. Can be applied to a wide range of operations as well as the handling of rust preventatives and other coatings.
OPTIMUS DRYERS embody a specially designed system of directional air jets which assure spotless drying after plating or polishing and before subsequent painting, plating or lacquering.
Submit your metal parts cleaning problem to our engineering staff.
Distributors of
"Midsolv"
A Perchlorethylene Degreaser Solvent
"Triclene D"
A Trichlorethylene Degreaser Solvent
Send for complete catalog and additional information
OPTIMUS EQUIPMENT COMPANY
13 Water Street Matawan, N. J.
Offices in principal cities
OPTIMUS EQUIPMENT
FOR CLEANING · RINSING · DEGREASING · PICKLING AND DRYING OF METAL PARTS

. . . . . Improved MICCROLOID

INDUSTRIAL CORROSIVE RESISTANT

MICCROLOID is a tough, resilient, firmly adhering coating that stops corrosion in its tracks. Wherever corrosive conditions are severest—where ordinary coatings have failed—MICCROLOID will prove its worth. That's why it enjoys such wide application in varying industries—on plating equipment, acid and alkali rinse tanks, structural steel, factory walls and floors, pipe lines, air ducts, ventilating systems, process piping and tubing, water storage, water softening and refrigerating equipment, etc. A trial quantity of MICCROLOID is yours without cost or obligation. Merely write our office or your favorite distributor and specify your particular problem.

Improved MICCROLOID is available in aluminum, white, black, gray, blue, and clear.



MICCROLOID PRIMER

A New Prime Coat for MICCROLOID

A specially formulated primer . . . quick drying and flexible . . . which provides maximum adhesion on hard-to-stick-to metals such as brass, tin, lead, galvanized metal, zinc, steel, cadmium, magnesium, aluminum, or bronze. MICCROLOID Primer acts as a rust inhibitor . . . protects metal before painting . . . forms insoluble phosphates at the metal surface . . . prevents corrosion from creeping beneath the paint film . . . and provides a corrosion-resistant anchor coat.

Write for detailed bulletin.

MICHIGAN CHROME and Chemical Company

6340 East Jefferson Avenue • Detroit 7, Michigan

MICCRO

Developed and Manufactured by Experienced Platers

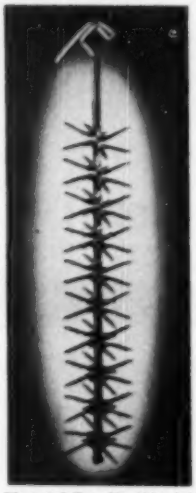
PLATING RACKS
by JOSEPH NOVITSKY

Also Rack Coating Service with Air Dry or Plastisol Type Coatings

Our customers tell us this plating rack is the handiest rack they have ever seen or used. We do not claim this rack will do everything, but once you try this rack you will never be without it.

We design plating racks for any part, and also build racks to your specifications.

All parts are replaceable on our patented plating racks.



Illustrated, Type No. 101 to hold 50 pieces; same type rack can be constructed to hold any number of pieces. Patent No. 2,258,391.

NOVITSKY PLATING RACK CO.
104-14 148th Street Jamaica 4, N. Y.
Phone: REpublic 9-7223

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 249.

For Sale

Slightly Used BUFFS

LOOSE AND SEWED

ANY QUANTITY

ALL SIZES

MICHIGAN BUFF CO., INC.
3503 GAYLORD AVENUE DETROIT 12, MICHIGAN

Industry News

solidation of manufacturing operations production economies are being accomplished which can be passed on to the user. An important part of the plan is an integration program which will greatly broaden the scope of services available through a nation-wide organization of sales engineers and technical field men with offices in forty principal cities.

Wyandotte Chemicals Corporation of Wyandotte, Mich., has recently acquired approximately 200 acres of land at Dilles Bottom, Ohio, ten miles south of Wheeling, W. Va. Included in the new property is a 2300-foot frontage on the Ohio River. Although no immediate construction is contemplated, the new site was acquired for future additions to the corporation's organic chemical facilities and for expansion of its electrolytic chlorine and caustic soda plants. It has natural resources of salt, coal, oil, gas and water either on or adjacent to the property.

SALESMEN

Established organization, selling quality products, offers an opportunity to men who are now contacting the plating and metal finishing industry, to handle an additional product. Will not conflict with your regular line. Replies held in strictest confidence.

Reply to:

P-4A, PLATING
P. O. Box 168, Jenkintown, Pa.

POSITION WANTED

Management or selling for an established electroplating shop. Experienced in electroplating and industrial finishing; salesman and cost expert; familiar with the Philadelphia area jobbing trade. *Reply to:*

P-4B, PLATING
P. O. Box 168, Jenkintown, Pa.

SALESMAN

Situation open: Old established manufacturer of plating and polishing equipment and supplies desires salesmen for Chicago and midwestern territories. Prefer men with some mechanical and plating knowledge; industrial selling experience required. Excellent opportunity. Write fully, giving age, nationality, and educational and business details. *Reply to:*

P-4C, PLATING
P. O. Box 168, Jenkintown, Pa.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 250.

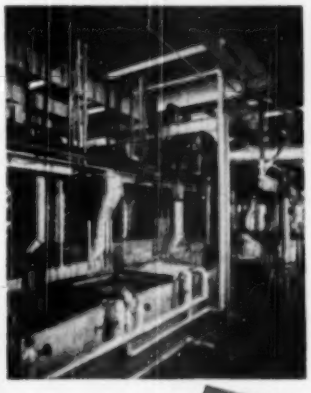
MEAKER Electroplating Machines

Tailored to Fit

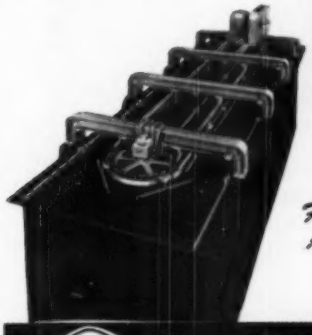
Typical Meaker Straight-A-Way Automatic Machine. This machine was built for copperplating three rows of work simultaneously. It handles 125 racks per hour that are 16 inches wide, 14 inches thick, and 70 inches long.

Meaker Special Machine designed for cleaning and silver plating small, brass contact clips. The unit is loaded at one point and the parts are carried through the operating sequence and automatically discharged into a container when completed.

Meaker Return-Type Automatic Machine for chromium plating the large variety of parts in a high-quality line of plumbing hardware.



A Meaker Semi-Automatic Machine for use in medium-output plating departments. This type equipment is used in large, job plating plants to supplement the capacity of automatic machines.



Equipment tailored to fit your requirements, making every operation in the plating sequence automatic, or as mechanized as possible, is the profitable way to handle electroplating on a production basis. This Meaker method applies equally well to departments with only moderate daily output and to the largest and heaviest automatic plating needs of the mass production plants. It offers not only a lower unit cost, but the production is increased, and a better and more uniform quality of product is assured.

Write for the Full Information. Ask for Booklet No. 148 →

50th Anniversary 1899 1949

Serving the Plating Industry with the Best, Most Up-to-Date Equipment

THE MEAKER COMPANY

1639 South 55th Ave., Chicago 50, Illinois • Telephone CRawford 7-7202

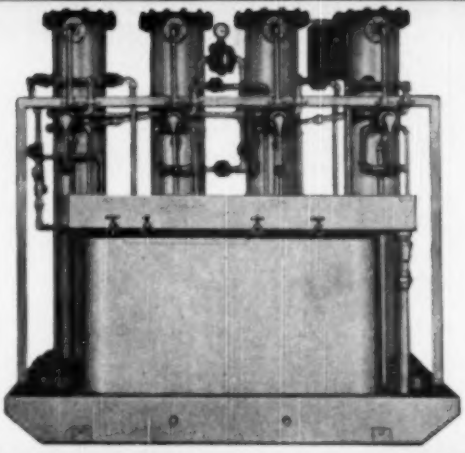
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 251.

For

Water that leaves no stains after hot rinse

Water that causes no unwanted precipitates in solutions

INDUSTRIAL'S NEW ION EX DEMINERALIZERS



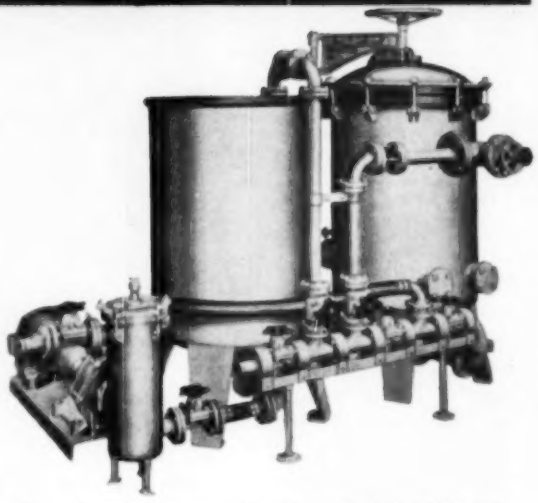
These ion-exchange demineralizers deliver the chemical equivalent of distilled water by simply passing water through ion-exchange resins. All dissolved mineral salts are removed without the use of any stills, heat, or steam. No cooling water is required and there are no scale formations. And the cost of this demineralized water is only a few cents per 1000 gallons compared to the several dollars for distilled water or steam condensate.

Model L-200 Four-Bed Industrial Water Demineralizer for a nominal flow rate of 200 gph. Other standard models available with capacities of 5 to 1000 gph. Special units of any capacity engineered to requirements.

For

Dependable Results in Solution Clarification

INDUSTRIAL'S FILTERS AND FILTERING SYSTEMS



A typical Industrial Stationary Filter System. Standard models—portable and stationary types—are available in capacities of 100 to 15,000 gph. Special filters are engineered to meet unusual requirements.

In production filtration here are some points to check. Compare these construction and operating features of Industrial's filters.

Industrial's filters are conservatively rated on capacity. Compare the filtration area, the sludge holding capacity of the filter chamber, and the pump characteristics. All these factors govern the capacity of the filtering system. The filter cloths in connection with filter aids provide efficient, low-cost filtration in either continuous or intermittent service.

The air wash cleaning feature does not require any dismantling of the filter or removal of the cover. Industrial's filters have operated for months without opening—opening is required only for replacing filter cloths or for periodic inspection. This feature is a great time and labor saver.

★ *Write for full information and recommendations*

INDUSTRIAL FILTER & PUMP MFG. CO.

1623 West Carroll Avenue • Chicago 12, Illinois

FILTERS Pressure Type · PUMPS Centrifugal · CORROSION TESTING APPARATUS Salt Fog, Humidity

RUBBER DIVISION Vulcanized Linings • Molded Products · ION EX DEMINERALIZERS

Personals

John N. Brickman, formerly Field Engineer for Norton Company, Worcester, Mass., has been appointed Abrasive Engineer in an additional territory recently created in the city of Chicago.

Dr. George P. Swift, Consulting Engineer of Watertown, Mass., has been elected a director of the American Institute of Mining and Metallurgical Engineers, Inc., one of the four "Founder Societies" in the engineering field with headquarters at 29 W. 39th Street, New York, N. Y. The term is for three years, starting in February, 1949. Dr. Swift is the Secretary of the Boston Branch of the American Electroplaters' Society.

William S. Loose has been appointed Sales Manager of the Magnesium Division of Dow Chemical Company, Midland, Mich. He was formerly with the Metallurgy Section.

George Morrow, Bridgeport, Conn., has joined the sales force of the C. W. Haynes Laboratories, Inc., Springfield, Mass. He will cover the Southern Connecticut territory where he formerly represented the Egyptian Lacquer Manufacturing Company for over twenty years. An A. E. S. member for the same length of time, he is well known among platers as an amateur magician.

Melville Morris has been appointed Executive Vice-President and member of the Board of Directors of Optimus Equipment Company, Matawan, N. J. This appointment follows the recent merger of the Midwestern Manufacturing Company of New York with the Optimus Equipment Company, a subsidiary of the Hanson-Van Winkle-Munning Company.

In line with the enlarged scope of operations Mr. Morris announces the appointment of **A. Otto Millen** as Middlewest District Supervisor.

Seymour

Dr. Raymond B. Seymour, formerly Chief Chemist for Atlas Mineral Products Company, has returned as Executive Vice-President and General Manager. Dr. Seymour was previously associated with the development of several of the corrosion resistant cements, linings and protective coatings now manufactured by the company and one of his assignments will be the direction of research. He has earlier been associated with the Goodyear Tire and Rubber Company as research chemist, with Monsanto Chemical Company as group leader in plastics and rubber research, as director of the Industrial Research Institute of the University of Chattanooga, and as director of Special Products Research for Johnson & Johnson.

W. H. Mikesell has been appointed sales and service representative in the Chicago area for Unichrome Synthetics and Ucilon Protective Coatings, according to announcement by United Chromium, Inc.

Mr. Mikesell is a graduate of the University of Illinois with a B.S. degree in chemical engineering. During the war he served for three years in the U. S. Army Corps of Engineers. Before receiving this appointment, he received six months' training in formulating, testing and applying all types of organic coatings at the Carteret laboratories of United Chromium.

Donald W. Graham has been appointed District Sales Manager of the Heavy Chemicals Division of the Pennsylvania Salt Manufacturing Company to take charge of the Cincinnati Sales Office.

Mr. Graham, who has been in charge of Pennsalt's St. Louis office for several years, succeeds **C. W. Dermitt,** who resigned early this month. Temporarily, Mr. Graham will combine his duties at Cincinnati and St. Louis. A native of Prophetstown, Ill., Mr. Graham joined Pennsalt in 1932, a few years after being graduated from business school in Sterling, Ill. He became a salesman for the

7 Reasons Why They're Putting PC-7 AIR DRY-RACK COATING ON THE LINE

a Natural that Resists CORROSION

PC-7

1. Assures Protection
2. Needs No Baking
3. Cuts Your Costs
4. Has Adhesion
5. Resists Attack
6. Non-Contaminating

7 IT'S A NATURAL

It is the natural solution to your rack coating troubles. Try a gallon. Brush it over your coated racks and see how PC-7 can reduce your cost and step up performance!

Platers, everywhere, are putting their rack coating problems on the line . . . a heavy-duty barrier of PC-7 Insulation. Whether it's PATCHING or OVERALL protection, they are rapidly discovering the advantages of PC-7 . . . the perfect Air Dry Insulation that shaves material costs.

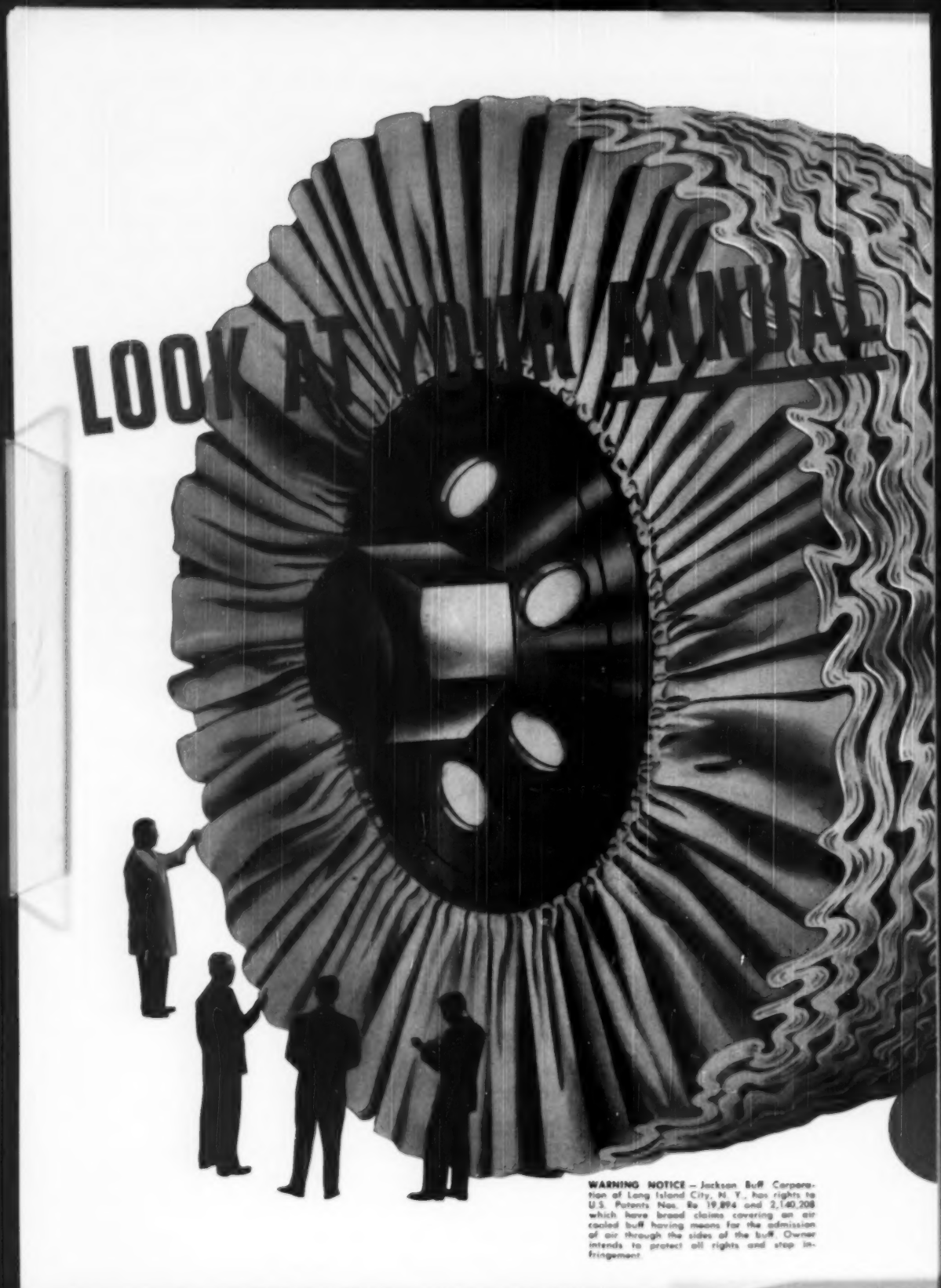
PC-7 quickly dries to a smooth flawless impregnable solid, forming a strong permanent bond with the rack that plating solutions can not penetrate.

PC-7 can solve your rack coating problems, too. Try it for your immediate PATCHING requirements and you'll soon be using PC-7 for the complete protection of every rack.

There's a MUNRAY Sales ENGINEER at Your Service

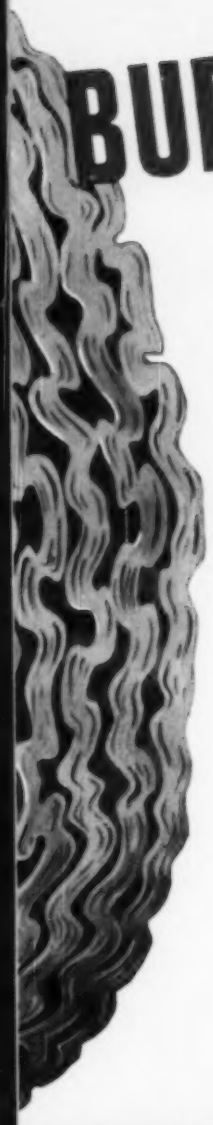
MUNRAY PRODUCTS, INC.
Sales Division of The POLY-CYCLO PRODUCTS Co.
12400 Crossburn Avenue • Cleveland 11, Ohio

USE READER SERVICE CARD; INDICATE A 253.



WARNING NOTICE – Jackson Buff Corporation of Long Island City, N. Y., has rights to U.S. Patents Nos. Re 19,894 and 2,140,208 which have broad claims covering an air cooled buff having means for the admission of air through the sides of the buff. Owner intends to protect all rights and stop infringement.

BUFF INVESTMENT!



What you spend for buffs in a year is definitely a sizable expenditure.

Per section, buffs are too often purchased with a "penny-wise, pound-foolish" consideration.

Jackson Airway Ventilated Buffs will reduce this expenditure by producing more work per dollar invested.

Here's why!

- They are scientifically designed with Jackson's patented airway ventilated feature, will not burn, therefore run cool, will not ravel and are in perfect balance, thus assuring longer life.
- There is a Jackson Airway Ventilated Buff which will meet every buffing need. Your requirements would be analyzed by one of our trained and experienced representatives.
- We have a wide range of types of buffs — and an equally wide range of prices.
- You don't want just any buff — it is what a buff does for you.
- You can't buy any buff on a price basis solely and get efficiency.
- Don't take quality for granted.

Ask us to demonstrate right in your own plant where you can watch the test.

JACKSON BUFF CORPORATION

21-03 FORTY-FIRST AVENUE • LONG ISLAND CITY 1, NEW YORK

Personals

Heavy Chemicals Division, attached to the Chicago office, in 1935, and went to St. Louis in 1943.

Dr. Fred E. Kendall has been appointed Vice-President and Director of Research and Sales of The International Rustproof Corporation, Cleveland, Ohio.

Dr. Kendall served as chief chemist in charge of electrochemical research for Republic Steel Corporation for a number of years and more recently as director of research for the Master Builders Company, Cleveland, Ohio, and in these positions has devoted much of his time to finishing problems. He was formerly a member of the chemistry staff at Western Reserve University, Cleveland, and later an associate professor.

Max

Dr. A. M. Max, Supervising Engineer in the Record Development Laboratory of the Radio Corporation of America, recently received the RCA Award of Merit for achievement, the outstanding award made each year by the RCA organization to its salaried personnel. Only fifteen employees are selected to receive the award each year, with nominations being made by all divisions of the company, embracing approximately 40,000 employees. Dr. Max received the award for outstanding work on metallizing and electroforming in the manufacture of metal molds used in phonograph record processes and for research and development work on the new RCA Victor 45-rpm record.

Dr. Max, who received his Ph.D. degree from the University of Wisconsin, has been with the company since 1944. He was formerly employed by Ternstedt Division of General Motors in Detroit. He is the Secretary-Treasurer of the Indianapolis Branch of the American Electroplaters' Society.

Dr. J. H. Monawreck is now finishing engineer with Illinois Watch Case Company, Elgin, Ill., manufacturers of the Elgin-American line of compacts, cigarette cases, and similar novelties. He is Librarian of the Chicago Branch of the American Electroplaters' Society.

C. W. Kraus was recently appointed to the New York Sales Staff of Bart-Messing Corporation, Brooklyn, N. Y., manufacturers of Sel-Rex selenium rectifiers and Sel-Rex precious metals for plating. A graduate of American Institute of Banking, he was formerly Credit Manager of the Millinery Trade Association, New York City, and a member of the Sales Division of the Chemical Department, National Oil and Supply Company, Newark, N. J.

MEMO { **On a better way to handle chrome plating solutions**

With this "outside heater" setup you can put all the advantages of the new Durco heat exchanger to work for you:

1. CORROSION RESISTANCE – Made of Duriron. Completely resistant to practically all plating solutions. Years of successful application throughout the plating industry.

2. NO DILUTION of solution.

3. EXCEPTIONALLY HIGH K VALUES obtained by a design that fully utilizes the pressure drop to break down fluid film.

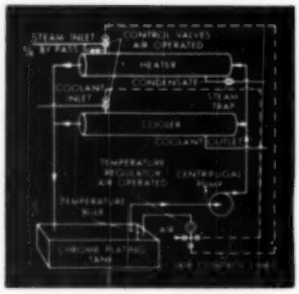
4. COMPLETE FLEXIBILITY OF INSTALLATION. Can be installed horizontally, vertically, near ceiling, on next floor or in next room.

5. NO PACKING AGAINST THE CORROSIVE SOLUTION.

6. MAINTENANCE – May be opened for inspection or cleaning without emptying tanks or shutting down.

Complete heat exchanger units including pump, pipe, fittings and valves mounted on single frame, are available.

For details, send coupon.



A sketch of a typical chrome plating installation showing use of Durco Heat Exchangers.

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

THE DURIRON COMPANY, INC.
DAYTON 1, OHIO

THE DURIRON CO., INC., DAYTON 1, OHIO

Gentlemen:
Please send me, without obligation, your bulletin 1603A on Durco heat exchangers for plating applications.

Name_____
Company_____
Address_____
City_____ State_____

Durco Adv. 83-GM

OBITUARIES

†**Eugene Zurbach,** 57, plater with the Argo Lamp Company, Philadelphia, met an untimely death when he was struck by an automobile near his home on the evening of February 5. An active member of the Philadelphia Branch of the American Electroplaters' Society since 1944, he was the father of Eugene Zurbach, Jr., Past President and former member of the Board of Managers of the same Branch.

†**Alexander M. Robson,** one of the founders of Reynolds-Robson Supply Company of Philadelphia, passed away on February 6 in the home of his brother-in-law whom he was visiting. He had been an active member of the Philadelphia Branch of the American Electroplaters' Society from 1927 to 1946 when illness forced his retirement from business.

†**Carl J. Larson** of the Advance Plating Company, Chicago, Ill., passed away on February 1 while on a visit to Sweden. He was seventy years old and had been with Advance since 1928. Interment took place in Sweden on Sunday, February 13.

7

WAYS TO CUT FINISHING COSTS USING

SEYMOUR BRIGHT NICKEL PROCESSES

Added to standard Watts or high chloride baths, any one of the three Seymour Bright Nickel Processes, "C", "NC", or "CX", will effect these savings.

1. Deposited nickel plate requires no further finishing before chromium plating. Chrome deposits more easily over bright nickel than over buffed nickel.
2. With no finishing required, or nickel buffed off, plate may be safely built up to specifications.
3. Base metals, except zinc base alloys, having acceptable finish may be bright nickel plated directly. No buffing is required after nickel plating.
4. Bright nickel plates directly on fine grained copper deposits, secured by deposition or coloring.
5. Excellent throwing power due to operation at a pH to 4.5 Electrometric. Plates deep recesses.
6. Perfect adherence to properly cleaned base metals even with very thin deposits.
7. Seymour bright nickel plated articles are often chromium plated without removal from original rack.

THE SEYMOUR MANUFACTURING CO., SEYMOUR, CONN.

Nonferrous Alloys Since 1878

SEYMOUR

The Mailbox

Subject: Corrosion Resistant Cements

DEAR SIR:

I have just finished reading the excellent article by Mr. V. A. Curll on the subject of "Corrosion Resistant Cements and Plating Room Practice", which appeared in your October issue. Your readers may be interested in the following additional information.

No silicate cement has ever yet been devised which has an absorption of water of less than 9 per cent. Sulfur cements have an absorption of about ½ percent, synthetic resins, ¼ per cent. Their considerably higher absorption plus their tendency to dissolve in neutral or alkaline waters regardless of how they are made to set or how good they are, limit the use of silicate cements in plating room floors to areas in which chromic acid, strong nitric acid, or other strongly oxidizing materials are encountered. Where the floor is likely to be washed down, even with neutral waters, or where they may come in contact with drainage from an alkali cleaner, silicates should be avoided since the joints will rapidly recede. In general, the choice of cement should be between sulfur and resin, except in the one case noted above.

An additional statement should be made with regard to synthetic resins. Phenolformaldehyde synthetic resins are extremely useful in plating shops except where concentrated caustics are encountered. A carbon-filled phenolformaldehyde, such as Carbo-Korez, Pennsalt's Causplit, and the like, gives excellent service in most other cases. Only one resin, the furan resin, is suitable for concentrated caustics. Furan resin cements will withstand all caustics in all concentrations and of all temperatures up to 375° F and are attacked only by strong oxidizing materials such as nitric acid or chromic acid. For these reasons, furan resin cements are more suitable for plating room floors than the phenolformaldehyde resin or any other cement.

A floor with furan resin cement is laid in exactly the same manner as one with phenolformaldehyde resin cement and, except for the increased resistance to alkalies, the description and information given by Mr. Curll applies to it.

Yours sincerely,
THE ATLAS MINERAL PRODUCTS COMPANY OF PA.
Walter L. Sheppard, Jr.

DEAR SIR:

Mr. W. L. Sheppard's points regarding the use of both silicate cements and resin cements are well taken and should be of assistance in choosing the correct cement for a particular construction.

Silicate cements in general, due to their admittedly high absorption, should not be employed in a floor system unless an adequate membrane is used between the floor base and the ceramic sheathing. Properly constructed, floors made with the use of silicate cements that have been manufactured with all ingredients in correct balance have given years of proven service without repair under conditions of washing with water and contact with weak and strong acids in all concentrations. Many silicate type cements on the market today, however, will be destroyed under such conditions.

The furans, one of the group of resin-type cements, are gaining acceptance in the corrosion-resistance field because their cost is slightly lower than that of the phenolics and not for reasons of superior ability to withstand chemical attack. The phenol-aldehydes are acknowledged to show less deterioration by all acids, except highly oxidizing materials, and when suitably modified are entirely unaffected by caustic solutions up to 70 per cent with the same temperature limitations as for the furans. Although carbon fillers are used in many resin cement formulations, e. g., PRF and Carbo-Korez, excellent alkali resistance is not dependent on this ingredient as exemplified by Causplit Cement.

Thus, although the furans have a definite place in some types of corrosion-resistant construction work and may be adequate for certain conditions, correctly chosen phenol-aldehydes will provide a greater degree of resistance to attack by solvents, acids, and alkalies and thus give a larger margin of safety.

Very truly yours,
PENNSYLVANIA SALT MANUFACTURING CO.
V. A. Curll

SPARKLER
horizontal plate
FILTERS
Good Plating Requires Clean Plating Solutions

Sparkler Horizontal Plate Filters effectively remove all solids and precipitates from plating solutions—provide positive assurance that solutions are free from undesirable matter.

The horizontal plate principle used by Sparkler makes possible the formation of firm, stable filter cakes that will not slip or crack under intermittent or continuous flow. Flow through the filter is always *with* gravity, and filter aid is floated into position, forming a firm cake of even thickness.

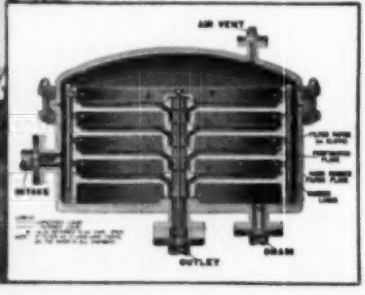
The accompanying photograph shows a typical Sparkler installation in a modern plating plant. Previously, in this plant, silver chloride slurry was shoveled into crocks and laboriously washed by decantation. Now, chloride is mechanically agitated, collected, and washed in the Sparkler filter. Cost of the operation has been sharply reduced and quality of the chloride has been greatly improved.

Filters are pressure-tight and leakproof, and are available in rubber-lined construction, stainless steel, or iron. Capacities from 60 to 10,000 G.P.H.

Our Engineering Service is available for your specific problems.

SPARKLER MANUFACTURING CO.
MUNDELEIN, ILLINOIS

This Sparkler Filter is used by a large silverware manufacturer in connection with the plating of silverware.



For that Extra-Bright ZINC PLATING

USE DU PONT

"DUROBRITE" ADDITION AGENT 309

(Formerly RH-309)

"DUROBRITE" ADDITION AGENT 309 OFFERS THESE OUTSTANDING ADVANTAGES

- Can be used for any type of cyanide zinc plating—in all types of plating equipment.
- Allows increased output with materials at hand.
- Increases throwing power of the bright plating range—provides greater lustre.
- Assists in consistent production of uniform bright plate.
- Provides increased economy and utility.

Highly Efficient in Barrel, Still, Semi- and Full-Automatic Units

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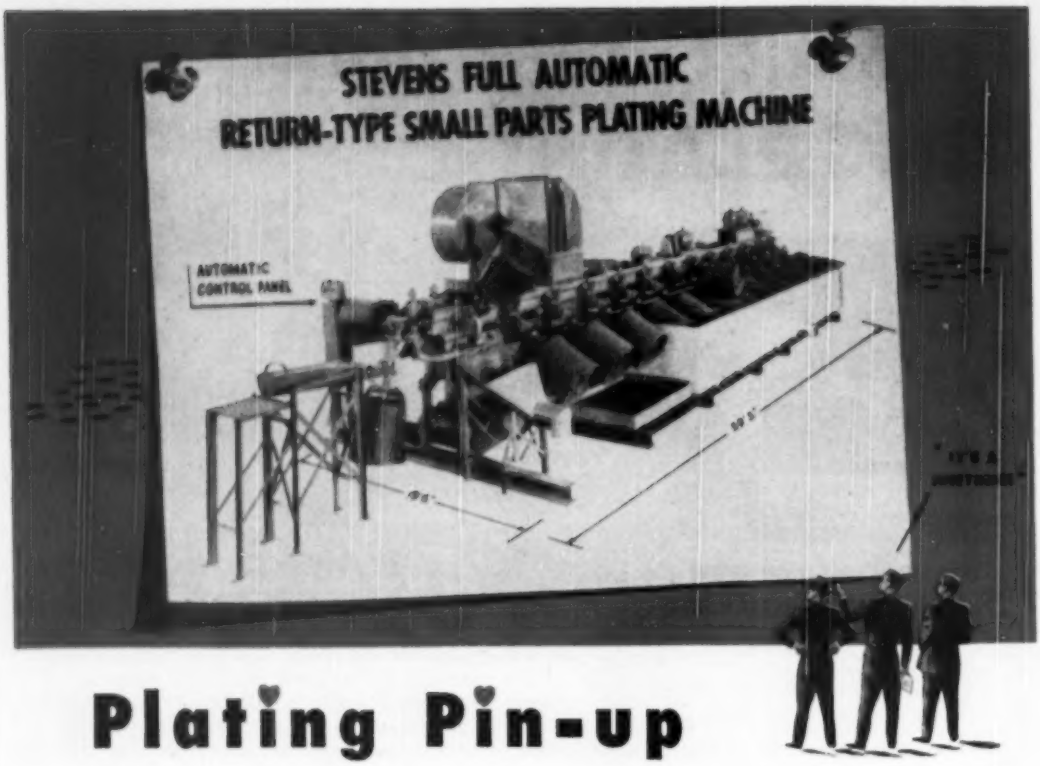

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The cover picture of racks of cross chains over a tank in a full-automatic plating machine is part of a story on page 349 about the manufacture of auto tire chains.

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APRIL, 1949

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Co-owners M. W. Hays (left) and Oliver S. Pendlay (right), discussing expansion plans with Sales Manager E. T. Brown.

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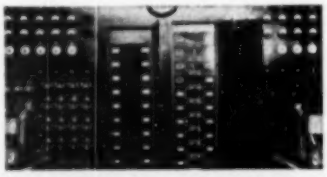

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Editorial

Now Is The Time . . .

EVERYONE WHO FOLLOWS the trends of the time realizes that activities in many industrial fields are slowly but surely tapering off and that profits in these fields are being reduced and, in some instances, have already disappeared.

One industry which has felt the pinch is the job plating industry which reports reduced prices on plating and continually rising costs. The job shop associations, for these reasons, keep up a steady campaign to convince their members of the necessity for knowing their costs and for accepting only such work as pays its way through the plant, including overhead charges. The admonition, know your costs, can properly be made to the whole plating industry.

But acting on cost information should extend further, to cost reduction. There is no question but that the industrial growth in this country has come about as a result of low unit price and large output; of willingness to write off inefficient equipment and processes, taking the loss, and to invest in the most efficient plant possible; of determination to face competition with aggressive action when the going has been tough. The time has come to reaffirm these basic principles.

Now is the time to take stock of the whole operation in the plating plant, not next month or next year when necessary capital may be more difficult to find if present trends continue. Now is the time to determine if processing steps can be eliminated with new processes, if new equipment and new layouts will be required to make the utmost use of the new processes, if new approaches to labor-managment relations will improve efficiency, if the organizational set-up, record-keeping, etc., serve production or production is stultified by out-of-date management methods. And now is the time to act on these findings.

The well-rigged ship is safe in any kind of weather, good or bad.

Gustaf Soderberg

2 VARIANTS OF ELECTROLYTIC CYANIDE WASTE DISPOSAL

The two articles published under this common heading were, by coincidence, submitted at about the same time. Fortunately, although both deal with the same basic process, they duplicate each other only in certain details. Mr. Oyler deals largely with a description of the process as carried out in his plant and gives details of installation costs. Messrs. Sperry and Caldwell report a laboratory investigation, paying particular attention to the chemistry of the process, and a plant trial, and provide data on the cost of operating an installation. The former employs copper anodes in his variant; the latter prefer stainless-steel anodes to carbon-steel anodes and also acid-treat their residues before disposal.

1. Disposal of Waste Cyanides By Electrolytic Oxidation

R. W. OYLER

Plating Engineer, Guide Lamp Division
General Motors Corporation, Anderson, Ind.

In the latter part of 1944, Guide Lamp Division was faced with the necessity of disposing of a considerable quantity of waste cyanides. Methods existing at that time were considered and rejected for the following reasons:

1. Some industries were successfully destroying cyanides by an acid treatment in which the hydrocyanic acid evolved was exhausted through a high stack under carefully controlled conditions. However, it was felt that this process did not lend itself to use with copper cyanide solutions since this salt would be precipitated and remain as a disposal problem.

2. One of the few recommendations received called for the use of calcium hypochlorite. This proposal was rejected since it required the use of large quantities of relatively expensive material and had the further disadvantage of calling for a chlorine chemical, a product which was under close wartime allocation and consequently was not readily available.

3. Others proposed burying the cyanide-laden residues. Because of the very real dangers of water contamination, this method also was not considered further. The practicability of hauling the material out to sea and dumping it—a similar suggestion—was likewise questioned.

4. Other methods now in use were not then developed.

It was in such an atmosphere that the method of disposing of waste cyanides by electrolytic oxidation was evolved.

Local Conditions

Disposal requirements at our plant then as now permit the use of a batch treatment system rather than demand a continuous one. By the use of such common devices as reclaim tanks and automatic solution level controls in conjunction with our plating solutions, ordinary waste waters sent forth from our plant contain such a negligible quantity of cyanides that dilution renders a final product that is acceptable in spite of the fact that our current operation involves over 50,000 gallons of copper and zinc cyanide solutions.

Cyanide material to be disposed in 1944 was furnished by solutions which had evaporated in the course of wartime storage and which because of high carbonate content were not considered suitable for plating use. Cyanides which came from discarded cyanide heat-treating pots which had broken in service also had to be destroyed. Since 1944, cyanide disposal activities have been limited to solution entrained by the precipitate formed in treating cyanide copper baths with barium hydrate for carbonate removal and to copper strikes that may have become contaminated with chromic acid to the extent that further treatment with sodium hyposulfite did not seem profitable. This latter item has never been high percentagewise but is mentioned in the interests of completeness.

The Process

The theory upon which our cyanide disposal activities are based is that of judiciously applying the opposite of proper plating conditions. In practice, this embodies the use of high temperature, insoluble anodes, and vigorous air agitation which results in accelerated decomposition of cyanide and yield products of carbonates and ammonia as well as perhaps some formates and cyanates.

Our process* frankly involves nothing new whatever except the application of the above-mentioned principles for the specific purpose of simultaneously destroying waste alkali cyanides which are mixed with other materials in such combination as to make it impractical to reclaim them and removing metallic ions from the solution. The end result is a relatively non-toxic solution which can be disposed of through sewage systems without harm either to municipal disposal plant equipment or to fish and animal life.

We do not claim that this method is necessarily the best solution to all industry cyanide disposal problems but merely that it is a method which is inexpensive and satisfactory in our own case.

To follow the workings of the method, let us assume that a copper cyanide plating solution has been treated with barium hydrate and activated carbon, the solution has been filtered back into the plating tank, and treatment is to be made of the remaining sludge and cyanide-bearing liquid which it entrains. Treatment of the solid material at this point may be broken down into three successive steps which will be discussed separately.

1. *Sludge Washing.* The sludge is diluted with about 2 to 3 times its own volume of hot (approximately 160 to 170° F) water and agitated thoroughly with mechanical mixers. The mixture is then allowed to settle and the supernatant liquid is decanted or filtered off and retained for the electrolytic treatment. The solids are again subjected to the same steps for as many times, usually four to six, as are necessary to bring the total cyanide content of the wash solution to such a low level as to indicate that the solids are

*Although General Motors Corporation has a pending patent application on the process, it is our understanding that the Corporation has no intention of asserting its patent rights against anyone since safety is involved.

relatively free from cyanide and may be safely dumped out of doors.

2. *Electrolysis.* The solution produced in Step 1 is transferred to the tank or tanks in which electrolysis is to take place. This operation is conducted under the following significant conditions:

(a) Solution very hot (200° F)
(b) Vigorous air agitation
(c) Use of copper electrodes
(d) As high current density as possible
(e) High ratio of anode-to-cathode area

Steel was originally used for anode material but was replaced by copper on account of polarization considerations. Because of changes in solution composition, copper will dissolve anodically only during the first three or four hours of operation. (For destruction of zinc cyanide, steel rather than copper anodes would obviously be used.)

At present, there are available for electrolysis one tank of 1200-gallon capacity and another of 1800-gallon capacity. Although tank design is not unduly critical, it is suggested that a maximum width of four feet will facilitate any electrode handling that might be necessary.

3. *Disposal.* When analysis has established that the solution by treatment in step 2 has reached a predetermined concentration of cyanide, there would, of course, be no copper remaining and the solution is safe to dump. It is emphasized that no particular total-cyanide concentration (in ppm) should be taken as an absolute value that can be applied to all situations. It is strongly recommended that a concentration level for dumping be set by a given plant only after a thorough study of the amount of dilution which may reasonably be expected and after consultation with local sewage-treatment plant technicians to determine permissible concentrations at the treatment plant and in streams, rivers, lakes or ponds.

Advantages and Disadvantages

Advantages of the process lie in the facts that little attention is required, the metal deposited on the cathodes may be used for plating-tank anode material, and solution composition is not critical but may range from a very low figure to the limit of solubility of the material being destroyed.

Experience has shown that total cyanide is destroyed at an average rate of about 1 oz/gal-day—the rate being much higher for high concentrations and diminishing as the cyanide concentration approaches zero. For example, a solution originally containing in excess of 7 oz/gal of copper cyanide was reduced to a concentration level of less than 0.3 oz/gal in a period of five hours. Obviously, when the cyanide came down into the range of parts per million, decomposition took place much more slowly.

The principal disadvantage of the process may be found where great quantities of cyanides must be destroyed. In these instances it is possible that generator and tank requirements would be so large as to make advisable the selection of another method if speed of destruction is essential.

Installation Cost

With the thought that some people may be interested in the equipment used, the following list of equipment and cost has been prepared. The prices are believed to reflect present-day levels.

The costs given for electrical connections, piping and valving, and the exhaust systems are approximations made by our Plant Engineering Section.

1. Mixing tank 7 x 7 x 3 feet deep of ¼-inch steel	$ 200.00
2. Two De Vilbiss air agitators, $75.00 each	150.00
3. Duriron pump, 2½ x 1	325.00
4. Two disposal tanks of ¼-inch steel	
14 x 4 x 3 feet deep	250.00
18 x 4½ x 3 feet deep	330.00
5. Overhead hoist, ½-ton capacity	65.00
6. Electrical connections material and installation cost	350.00
7. Piping and valving for water and steam material and installation cost	500.00
8. Exhaust-system duct work, fan and motor material and installation cost	2,000.00
9. Two automatic solution-level controls, $50.00 each	100.00
10. Two automatic temperature controls, $95.00 each	190.00
Total	$4,460.00

With reference to the above list of equipment and cost several things should be emphasized:

The equipment shown is not necessarily the best for the job in question, being used at Guide Lamp Division purely for reason of availability. The tanks, generator, hoist, and air agitators in particular are equipment which appeared to be surplus or available at the moment. For instance, the generator now in use is rated 4,000 ampere/12 volt; if a new generator were being purchased, no doubt one of a different rating would be selected. The cost of the generator, which was omitted from the list, can be approximated on the basis that 6-volt generators cost about $1.30 per ampere, 9-volt generators about $1.60 per ampere, and 12-volt generators about $1.95 per ampere.

An instance where a saving could be made by substituting other equipment for that which we are using is the Duriron pump. A 2½ x 1 pump costs at present approximately $329.00, while a 1½ x 1 pump at $246.00 no doubt would be adequate.

It will be noted that electrodes are not included as cost items. The reason for this is that most of our work is done on copper solutions. Since the copper is recovered, the cathodes not only are not a cost item but actually represent vehicles to effect the salvage of material.

2. Destruction of Cyanide Copper Solutions By Hot Electrolysis

L. B. SPERRY and M. R. CALDWELL

Jarvis Division, Doehler-Jarvis Corporation
Grand Rapids, Michigan

MANY PLATERS have at some time or other found it desirable to dispose of a large quantity of cyanide copper solution, either because it was necessary to put a different solution in the particular tank, or because it was so contaminated that purification was impractical or impossible. In most cases, the plater has "pulled the plug" and hoped that he would not get caught by the authorities.

The day of such practices is about over. The more progressive companies doing plating are already taking steps to treat their industrial waste properly before dumping it into the sewer. Indiscriminate disposal of waste into a sewer may result in destruction of soil pipe and subsequent undermining of a building's foundation, in plugging of a sewer, in serious damage to a sewage disposal plant's treating beds[1], or in contamination of a stream and subsequent destruction of animal and plant life.

For satisfactory disposal of a cyanide copper solution, not only must the cyanide be destroyed but the copper must also be removed and the *p*H brought within proper limits.

How, then, is the plater to dispose of a cyanide copper solution? The two methods of cyanide disposal most talked about recently are the lime-sulfur method[2], and the chlorination method[3]. The lime-sulfur method is not considered satisfactory because of expense, toxicity of the resulting solution, and incompleteness of the reaction. The chlorination method is more successful but requires a rather elaborate installation, including a chlorine injector, tanks, an agitator, pumps, etc. It also introduces the problem of sludge disposal and compels the use of good chemical control.

The authors, therefore, became interested in the destruction of cyanide copper solutions by hot electrolysis, which, while not new, seems to have been largely overlooked by the industry.

Laboratory Investigation

In investigating this method, cyanide copper solutions were electrolyzed at different temperatures and current densities in a four-liter stainless steel beaker, using the beaker as anode and a 3-inch wide brass panel, immersed to a depth of 6 inches and mechanically agitated, as cathode. The cathode agitation was transverse, with a one-inch strike and 90 cycles per minute giving a total travel of 180 inches per minute. As was demonstrated later by plant trials, this is not important.

A sample of the solution was taken for analysis every 2 to 5 hours. Electrolysis was continued until analysis of the sample showed that the copper had been completely removed and the cyanide completely destroyed.

Cathode current densities of 16 and 32 asf and corresponding anode current densities of 3.3 and 6.7 asf were tried at temperatures of 200°, 160°, and 120° F. Air agitation of the solution, in addition to the mechanical agitation of the cathode, was also studied. The effect of boiling without electrolysis was investigated. The first several tests were run on samples of different copper strike solutions taken from the plant. Samples for tests Nos. 8, 9, and 10 were taken from a stock solution. All solutions contained approximately 2 oz/gal Rochelle salts.

Test Results

Table I shows the conditions used in the different tests and the time required for complete destruction of the cyanide and removal of the copper. Table II gives the analyses of solutions before and after the electrolysis.

In test No. 1, the solution was simply boiled for 17 hours. The graph in Fig. 1 shows that boiling without electrolysis is of little value.

In Figs. 2 and 3, it is indicated that air agitation may actually slow down the process slightly. It appears that more rapid changing of the electrode films interferes with the reactions involved in destruction of the cyanide and, of course, that higher free cyanide gives lower cathode current efficiency, resulting in a longer time being required to plate out the copper.

Fig. 4 shows that the rate of destruction increases with the temperature. A temperature of 120° F is regarded as too low to be practical.

Fig. 5 shows that the rate of destruction increases with the current density.

Fig. 6 shows that the rate of destruction may vary considerably from one solution to another, the time periods required for these particular solutions being 30, 18, and 29 hours, respectively. The differences are believed due to contaminants.

Important factors in the speed of this method are the areas of anode and cathode per unit volume of solution, and the current concentration in the solution which may be measured in amperes per gallon. In the laboratory runs, these factors were:

Cathode areas, sq.ft/gal	0.25
Anode areas, sq.ft/gal	1.20
Current concentration, amp/gal	
Tests Nos. 2–4, 7–8, 10	8
Test Nos. 5–6, 9	4

It will be noticed that there are humps in the curves for cyanide and in some of the curves for copper. There are several possible explanations. One is that in calculating the total cyanide present, it was assumed

that the combined cyanide was present as $Na_2Cu(CN)_3$ while actually the sodium cyanide and copper cyanide also combine in other proportions[4]; the shifting of the equilibrium between the compounds introduces errors into the calculation of total cyanide. ¶Another explanation is the rapid changes in bath composition which undoubtedly affect the rate of destruction of cyanide and of deposition of copper in other ways.

Some of the reactions which may take place at the electrodes and in the solution are as follows:

At cathode:

$$Cu(CN)_3^{2-} + \Theta \rightarrow Cu + 3\ CN^-$$
$$H_3O^+ + 2\ \Theta \rightarrow H_2 + OH^-$$

At anode:

$$CN^- + OH^- \rightarrow CNO^- + H^+ + 2\ \Theta$$
$$3\ OH^- \rightarrow H_3O^+ + O_2 + 4\ \Theta$$

In solution:

$$CNO^- + 2\ H_2O \rightarrow HCO_3^- + NH_3$$
$$NH_3 + H_2O \rightleftarrows NH_4^+ + OH^-$$
$$NH_4^+ + CNO^- \rightleftarrows NH_4CNO \rightleftarrows CO(NH_2)_2 \text{ (urea)}$$

The solutions resulting from electrolysis contained no sodium hydroxide. The concentration of sodium carbonate was increased by approximately 2.5 oz/gal. About 3.0 oz/gal sodium bicarbonate and from 0.17 to 0.70 oz/gal cyanate were produced. The *p*H's were between 10.0 and 10.5.

Analysis

The analytical methods used will bear mentioning. The following determinations were made, and the concentration of carbonate, bicarbonate, and cyanate were calculated and cross-checked from them. The

TABLE I. TEST CONDITIONS AND TIME REQUIRED FOR COMPLETE DESTRUCTION OF CYANIDE AND REMOVAL OF COPPER

Test No.	Cathode Current Density* asf	Temp. ° F	Air Agitation	Time hours
1	0	Boiling	No	†
2	32	190–210	Yes	16
3	32	190–210	No	16
4	32	150–170	No	30
5	16	190–210	Yes	21
6	16	115–125	No	‡
7	32	150–170	No	18
8	32	190–210	No	16
9	16	190–210	No	19
10	32	150–170	No	28

*Anode current density 0.208 x cathode current density.
†Discontinued after 17 hours of boiling.
‡Discontinued after 27 hours.

TABLE II. RESULTS OF LABORATORY TESTS

	Analytical Data* in oz/gal									
	Before Electrolysis					After Electrolysis				
Test No.	Free CN	Total CN	Cu	OH	CO_3	Total CN	Cu	CO_3	HCO_3	CNO
1	0.50	....	....	....	....	†	....	....	....	....
2	0.50	4.45	3.22	....	....	0	0	....	....	....
3	0.54	3.72	2.59	....	....	0	0	....	....	....
4	0.40	3.05	2.16	....	0.41	0	0	....	....	....
5	0.40	3.61	2.62	....	....	0	0	....	....	....
6	0.36	3.47	2.54	0.14	0.15	2.2‡	1.12‡	....	....	....
7	0.40	3.28	2.35	0.93	....	0	0	....	....	....
8	0.34	3.59	2.65	0.18	0.46	0	0	1.75	2.05	0.20
9	0.34	3.59	2.65	0.18	0.46	0	0	1.92	2.20	0.70
10	0.34	3.59	2.65	0.18	0.46	0	0	2.52	0.74	0.17

*All results expressed in ion concentrations as shown.
†Free cyanide content dropped to 0.15 oz/gal after 17 hours boiling only.
‡When electrolysis was discontinued after 27 hours.

method is believed to be fairly accurate, but to determine just how accurate would be a project in itself.

The analysis for free cyanide was by the usual method—titration with silver nitrate in the presence of potassium iodide. The copper was also determined by the usual method—evaporation with nitric acid and titration with thiosulfate. The combined cyanide was calculated from the copper analysis. A gravimetric determination of carbonate was made, and the filtrate was used for the cyanate determination. It was titrated with standard sulfuric acid to a yellow color with bromthymol blue (*p*H range 6.0–7.6) and heated to boiling, the process being repeated until the color remained on the yellow side. The cyanate was destroyed by the sulfuric acid according to the following summary reaction:

$$2NaCNO + 2H_2SO_4 + 2H_2O = Na_2SO_4 + (NH_4)_2SO_4 + 2CO_2$$

Another sample of the solution was first titrated to a phenolphthalein end-point, from which the carbonate present as sodium carbonate was calculated, and then titrated hot to a bromthymol-blue end-point, just as described above. The second titration gives half of the carbonate present as sodium carbonate, plus all the bicarbonate, plus all the cyanate. Cross-checking indicated that the results were fairly close.

Destruction of Cyanates

There are confusing statements in the literature as to the toxicity of cyanates. One of the latest papers[5] places the maximum tolerance of creek chubs to sodium cyanate at 75 ppm (49 ppm of CNO). This is much lower than the tolerance stated in another paper[6], whose author found that adult minnows showed no effects in 24 hours from 264 ppm of potassium cyanate (137 ppm of CNO). A competent authority states[7] that general opinion at present is that they are about 1/1000 as toxic as cyanides, which would set the maximum amount permissible in plant waste at about 1,000 ppm, or 0.13 oz/gal. It may be concluded that in the concentrations found in an electrolytically destroyed cyanide copper solution, which may run up to 5,000 ppm (0.70 oz/gal) or more, cyanate is toxic and should be destroyed before the solution be discharged into a sewer.

After the cyanide has been destroyed and the copper removed from a solution, the cyanate may be easily destroyed by the method already described for analysis of cyanates; i. e., by addition of sulfuric acid until the *p*H, after boiling, remains just below 7.0. The amount of acid required should of course be determined in the laboratory.

Naturally, the solution and the diluted sulfuric acid must be allowed to cool before the acid is added, slowly and with agitation.

If, after treatment, the *p*H is found to be too low, it is a simple matter to adjust it before dumping the solution into the sewer.

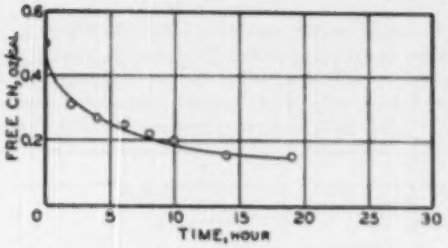


Fig. 1. Effect of boiling only on cyanide destruction (Test No. 1)

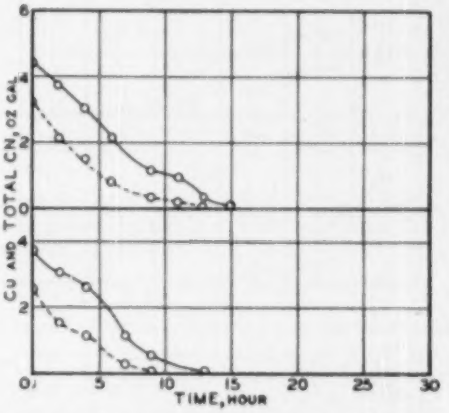


Fig. 2. Effect of air agitation at 190 to 210° F on total-cyanide, CN, destruction (solid lines) and copper deposition (broken lines) at cathode current density of 32 asf and anode current density of 6.7 asf. With air agitation (Test No. 2) at top, without air agitation (Test No. 3) at bottom

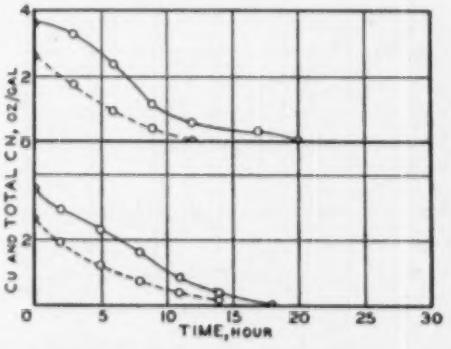


Fig. 3. Effect of air agitation at 190 to 210° F on total-cyanide, CN, destruction (solid lines) and copper deposition (broken lines) at anode current density of 3.3 asf and cathode current density of 16 asf. With air agitation (Test No. 5) at top, without air agitation (Test No. 9) at bottom

Plant Trial

In setting up this operation in the plant, it is possible, by careful preparation, to utilize the plating tank for the cyanide destruction process and carry it out over a week-end. It is absolutely necessary, however, if the job is to be done in the time allotted, to supply sufficient cathode and anode areas per unit volume of solution. Considerable heat is evolved by the passage of current, and the heat loss from a large tank is small enough so that very little additonal heat is required to maintain the temperature at 200° F or higher. A 9 or 12 volt source is desirable

If desired, a special tank may be set up for this process. The illustration in Fig. 8 shows a cross-sectional end view of a 700-gallon tank arranged for maximum utilization. The effective anode and cathode areas are each 0.26 sq.ft/gal. Destruction of the solution in 16 hours would require 32 asf x 182 sq.ft. = 6000 amperes.

A plant trial was run in which a Rochelle copper strike solution was destroyed in this processing tank. Although space was available on the anode and cathode bars for more electrodes, it was not considered advisable from a cost standpoint to have them built for this trial run and only two rows of steel-plate cathodes were placed between three rows of steel-plate anodes. Other data are shown in Table III and Fig. 7.

At the end of the run, analysis and calculation indicated that 20 gallons of sulfuric acid were required to bring the *p*H from 10.2 to 6.5. This was added, after diluting 3 to 1 with water and cooling, slowly and with air agitation. The solution became quite blue due to the presence of ferric ferrocyanide (Prussian blue). The *p*H was again checked and the solution dumped.

The amount of fumes given off from the hot solution during electrolysis was, of course, considerable,

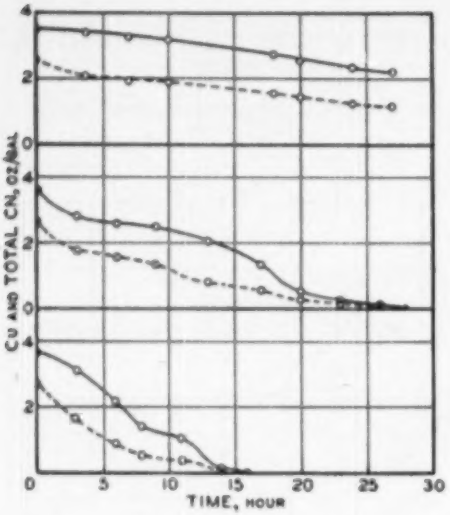


Fig. 4. Effect of solution temperature on total-cyanide, CN, destruction (solid lines) and copper deposition (broken lines). Top: Test No. 6 at 115 to 125° F, anode current density of 3.3 asf and cathode current density of 16 asf; middle: Test No. 10 at 150 to 170° F, anode current density of 6.7 asf and cathode current density of 32 asf; bottom: Test No. 8 at 190 to 210° F, anode current density of 6.7 asf and cathode current density of 32 asf

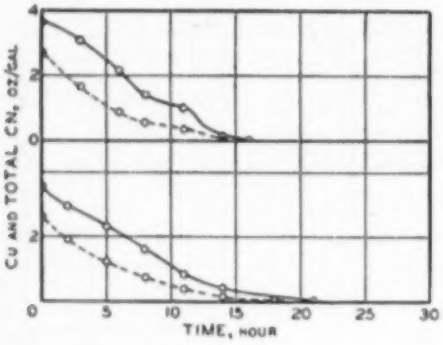


Fig. 5. Effect of current density at 190 to 210° F on total-cyanide, CN, destruction (solid lines) and copper deposition (broken lines). Top: Test No. 8 with anode current density of 6.7 asf and cathode current density of 32 asf; bottom: Test No. 9 with anode current density of 3.3 asf and cathode current density of 16 asf

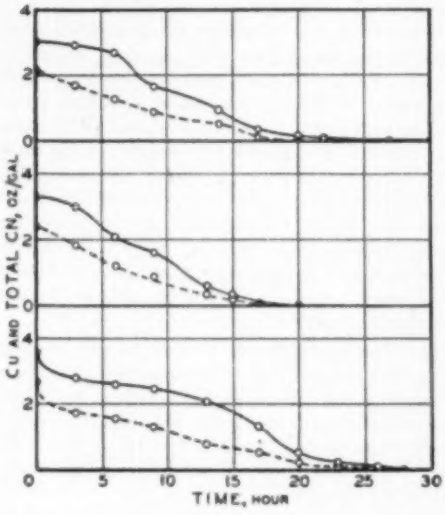


Fig. 6. Effect of solution used on total-cyanide, CN, destruction (solid lines) and copper deposition (broken lines) at anode current density of 6.7 asf, cathode current density of 32 asf, and 150 to 170° F. Top: Test No. 5; middle: Test No. 7; bottom: Test No. 10

TABLE III. RESULTS OF PLANT TEST

Tank size: 10 x 2.5 x 4 feet deep; volume of solution: 700 gal
Cathode and anode areas: 72 sq.ft = 0.1 sq.ft/gal
Agitation: air, hourly, through pipe on end of air hose
Generator: 5000 amp/6 volts. Average current density: 35 asf

Time hour	Volt	Ampere	Temp. °F	Analysis* Total CN oz/gal	Cu oz/gal	CO_3 oz/gal	pH	OH oz/gal
0	6.2	2800	155	2.83	2.10	2.16	13.05	0.70
8	5.8	2300	180	2.20	0.71	.....	.....	.....
16	6.0	2700	175	1.13	0.055	.....	.....	.....
24	5.75	2600	195	0.39	0.00	.....	.....	.....
32	5.8	2250	183	0.04	0.00	.....	.....	.....
40	6.75	1000	178	0.00	0.00	7.10	10.2	0.00
Average	...	2530	...	.....	.....	.....	.....	.....

Time required to remove copper (from graph)—18 hours. Time required to destroy cyanide (from graph)—35 hours.
*All results expressed in ion concentrations as shown.

and an appreciable deposit was formed in the exhaust ducts. This deposit is best returned to the tank.

For the purpose of the investigation, the solution was maintained at a fairly constant level by frequent additions of water. In plant practice, the process would probably be speeded by allowing the solution to evaporate to a fraction of its original volume.

The carbon-steel anodes were rapidly attacked toward the end of the run. This is to be expected, since the *p*H drops appreciably. Obviously, the steel tank should not be used as anode. Other investigators have found that low-carbon steel as an anode in cyanide solutions corrodes considerably less than stainless steel[3], but these determinations were probably made in solutions of higher *p*H. After some 60 hours of plant operation, the current on the tank had dropped from 2800 to 400 amperes. The anodes were then pickled in inhibited muriatic acid and electrolysis resumed. The current rose to 4400 amperes, but in 10 minutes dropped to 3900 amperes. Anodes of 18-8 stainless steel would be much more permanent and require no maintenance but would, of course, have a much higher initial cost.

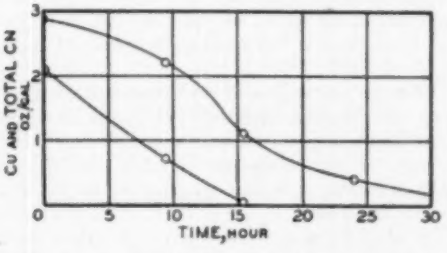


Fig. 7. Results of 700-gallon plant test on total-cyanide, CN, destruction (solid line) and copper deposition (broken line). Average anode and cathode current densities during first 32 hours, 36 asf; solution temperature 175 to 195° F. Total cyanide 0 after 35 hours

Cost

The cost of this operation was calculated as follows:

Heat

Bring solution to 180° F	$ 1.20
Maintain at 180° F for 40 hours	6.00
Bring solution to boiling, after cooling	1.40

(Continued on page 412)

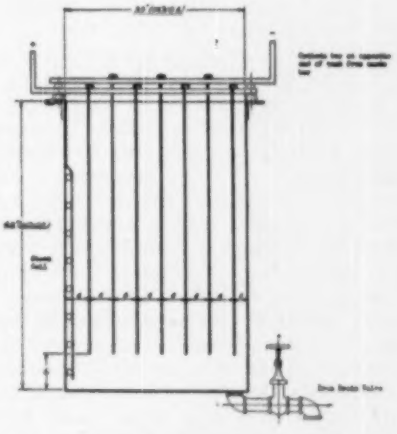


Fig. 8. Proposed tank for destruction of copper strike solution. Tank size 120 x 30 x 48 inch deep, holding 700 gallons of solution. Anode and cathode areas 6 (sides) x 3¼ x 9¼ feet or 182 sq.ft (anodes and cathodes begin 4 inches from tank ends)

EDWARD J. MUSICK

EDWARD J. MUSICK, President of Musick Plating, Inc., is one of the outstanding leaders in the job plating industry. Born on July 20, 1883 in St. Louis, he graduated from the Manual Training School connected with the Washington University in 1902 and went to work for Barry, Wehmiller Machinery Company as a mechanical draftsman. He left this job to go west, to Portland, Oregon, for the World's Fair in 1905, where he had charge of the exhibit of the Koken Company.

In 1906 he returned to his home city and started work with Degge & Musick, electroplaters, a company which had been founded by his father, William H. Musick, and M. D. Degge, in 1880. Their business consisted mainly of polishing and plating of stove castings for the large stove companies in the St. Louis area. In 1914 Mr. Musick bought out Mr. Degge's interest and formed a partnership with his father under the name of Musick Plating Works; in 1918 the business was incorporated.

When the St. Louis Branch of the American Electroplaters' Society was first organized in 1909, H. H. Williams called on Ed and his father and it did not take long to convince them that the A. E. S. would do great things, not only for job shop platers, but for the whole industry. Within a year, under the guidance and influence of such men as H. H. Williams and Hedley J. Richards, he became the permanent chairman of arrangements for all St. Louis Branch affairs, a position which he held until recent years. He has also been President of the Branch at three different times, and has always been ready to give it the benefit of his experience and judgment.

His Branch activities soon led Mr. Musick into the National field, and he served with distinction as Vice-President, Secretary-Treasurer, and President of the American Electroplaters' Society in 1924, 1925 and 1926, respectively.

Being a job plater himself, Mr. Musick has always been actively engaged in promoting the job platers' business and interests. In that role he has served as President of the Mississippi Valley Platers Institute for the past twenty-eight years. In the days of the N. R. A. he was Vice-President in 1934 and Councillor in 1935 of the Masters Electroplaters Association. Later he became active in the formation of the National Association of Metal Finishers, Inc., and served as its President in 1945–1947 and as a member of its Advisory Committee to the Defense Procurement Agency in Washington, D. C.

He is also a member of the Engineers' Club of St. Louis, the Missouri Athletic Club, Rotary Club, Sons of the Revolution, and many civic and fraternal organizations. With an attendance record of 26 years without missing a Rotary meeting he thinks Rotary must be his hobby.

Mr. Musick's many outside activities have not been allowed to interfere with his own business. He is credited with having developed a good organization to take care of the various responsibilities of a large job shop, and states that some of the third generation is beginning to look promising.

STEPS IN MANFACTURE →

MANUFACTURE OF AUTO TIRE CHAINS

This article deals with a subject which the layman may expect to be simple and straightforward. The authors, N. J. Gebert and A. M. Roberts, Chief Metallurgist and Metallurgist, respectively, of American Chain Division, American Chain and Cable Company, York, Pennsylvania, however, show that the transition from raw material—wire—to finished product—tire chain—requires numerous operations, including plating, each of which has a definite objective and has had to be designed with attention to a number of factors. Collectively the operations impart to the chain the safe, long-lasting features that are synonymous with the high-quality tire chain of today.

Tire chains are made from coils of high-grade low-carbon steel welding wire, on which are placed special restrictions regarding analysis and physical properties. Elements deleterious to welding cannot be included in the make-up of the steel, and elements imposing undesirable physical properties on the finished product are likewise not acceptable.

The more important operations involved in making a tire chain are listed below:

1. Forming
2. Link welding
3. Twisting
4. Bar welding
5. Heat treating
6. Polishing
7. Plating
8. Assembling

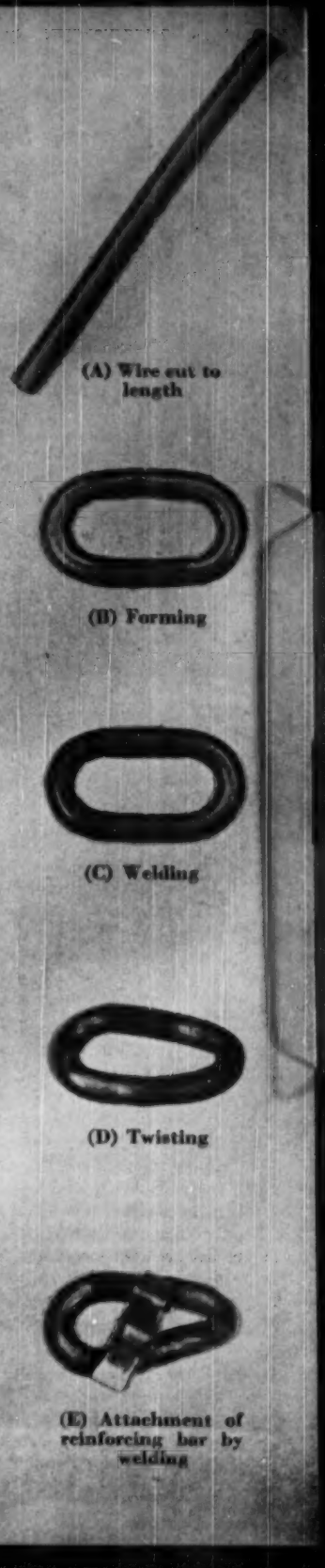
In order that each operation be understood, they will be discussed individually to ascertain the reason for, and effect of, each.

Forming

Forming is the act of bending a piece of wire (Step A) into the shape of a chain link (Step B). By the use of specially designed machines, it is possible to repeat this operation with amazing rapidity, and in such a manner that links formed consecutively are interconnected. This enables long lengths of formed chain to be made without the assembly of a series of individual links.

Link Welding

The chain as it comes from the forming machine has practically no strength, because each link contains a butted joint. In order to make each link a continuous uninterrupted oval of steel, it then becomes necessary to weld these joints. Welding is of the electrical-resistance butt type, with



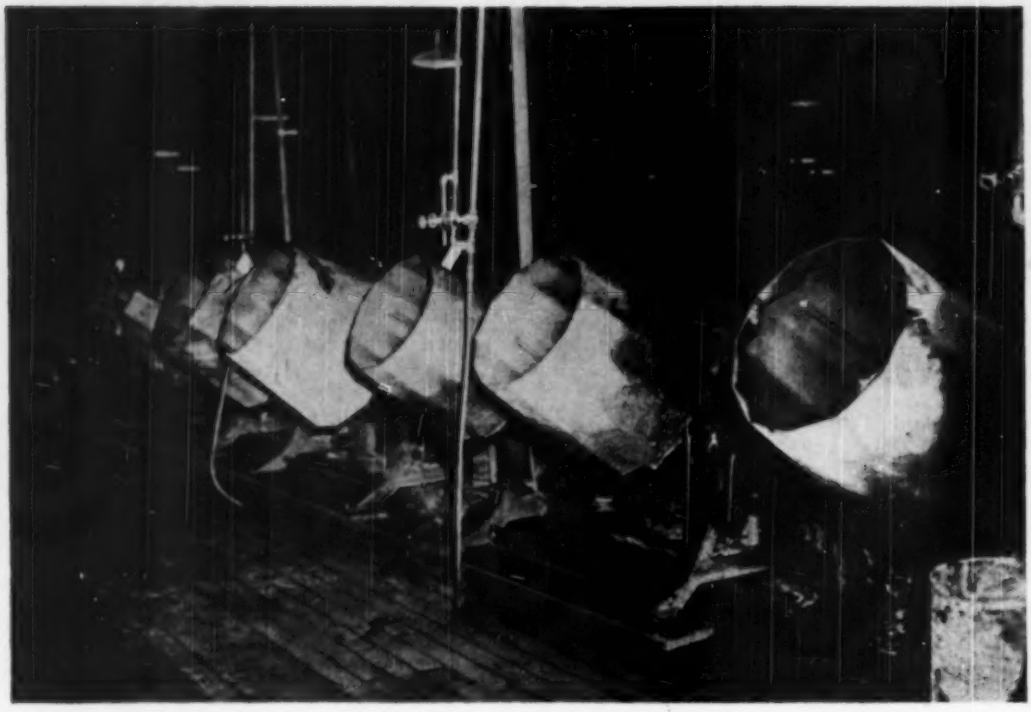
(A) Wire cut to length

(B) Forming

(C) Welding

(D) Twisting

(E) Attachment of reinforcing bar by welding



Wet tumbling to remove dirt, rust and scale

extremely large quantities of electrical energy furnishing the heat necessary to bond the joint. Each welder is equipped with devices for trimming the welded area to approximately the same diameter as that of the parent material, so that the appearance of each link is that of a continuous piece of wire (Step C).

Twisting

The next step consists of twisting each welded link so that the link will subsequently lie flat against the automobile tire and so that a higher unit pressure will develop between the chain and the ice. The twisting operation also reduces the overall height of the tire chain, with the net result of a smoother, less bumpy ride. Twisting is accomplished by gripping one-half of each link in a stationary die and the other half in a rotating die, which allows any degree of twist to be obtained by setting the distance through which the movable die is allowed to rotate (Step D).

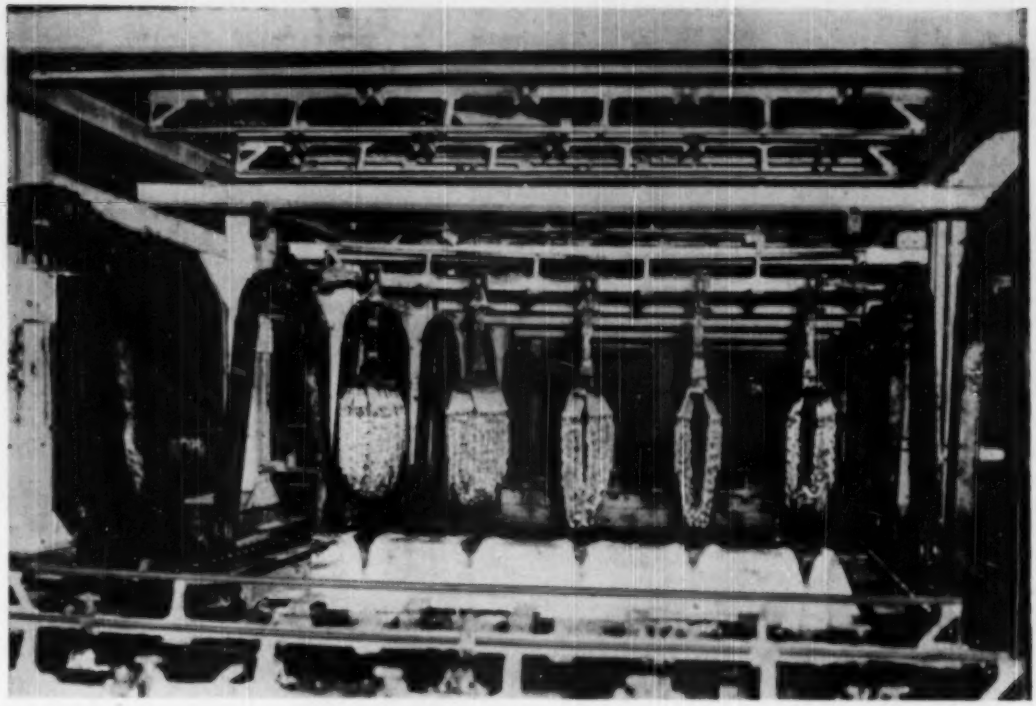
Bar Welding

In the manufacture of high-quality tire chains, the individual links are further strengthened by the addition of a reenforcing bar, welded to each side of each cross chain link (Step E). This bar, by its design and shape, serves a number of important functions: first, it acts as a truss member to make the link more rigid; second, since it is shaped like a "V", it provides additional sharp bearing points to dig into the ice; third, since the bar reenforcement must be entirely worn through before any of the chain link proper begins to wear, the life of the chain is lengthened considerably.

Heat Treating

It would simplify things appreciably if tire chains could be used in the degree of hardness that exists after bar welding. However, the endurance or "life" of such a soft chain is so limited as to be impractical. Apparently then, some type of heat-treating operation, which will impart the ultimate physical properties to the chain, must be employed. The chain must be made hard, but not brittle; also wear resistant, but capable of withstanding severe impact. The type of heat treatment used by practically all chain manufacturers to develop these qualities is case carburizing. The depth of the case must be carefully controlled, as well as its hardness.

The heat-treating operation is carried out in large retort-type furnaces, through which passes a constant flow of carbon-rich gas. It is this gas that supplies the hot steel with the desired amount of carbon. After having been carburized for a sufficient time to acquire the needed case depth, the chains are extracted from



View of straight-line full-automatic zinc plater with one cross rod in transfer

the furnace and quenched in cold water, promoting the full hardening of the chain.

Polishing

Polishing for electroplating serves the purpose of removing the dirt, rust, and scale found adhering to the chain links after heat treatment. Since there are many in accessible places which must be physically and chemically clean, polishing is carried out in a liquid medium.

The twelve-sided steel, open-end tumblers used in this operation are capable of being tilted to facilitate charging and discharging of the load. They rotate at a comparatively high speed, thus causing much burnishing action of the chain while it is being subjected to the attack of the liquid.

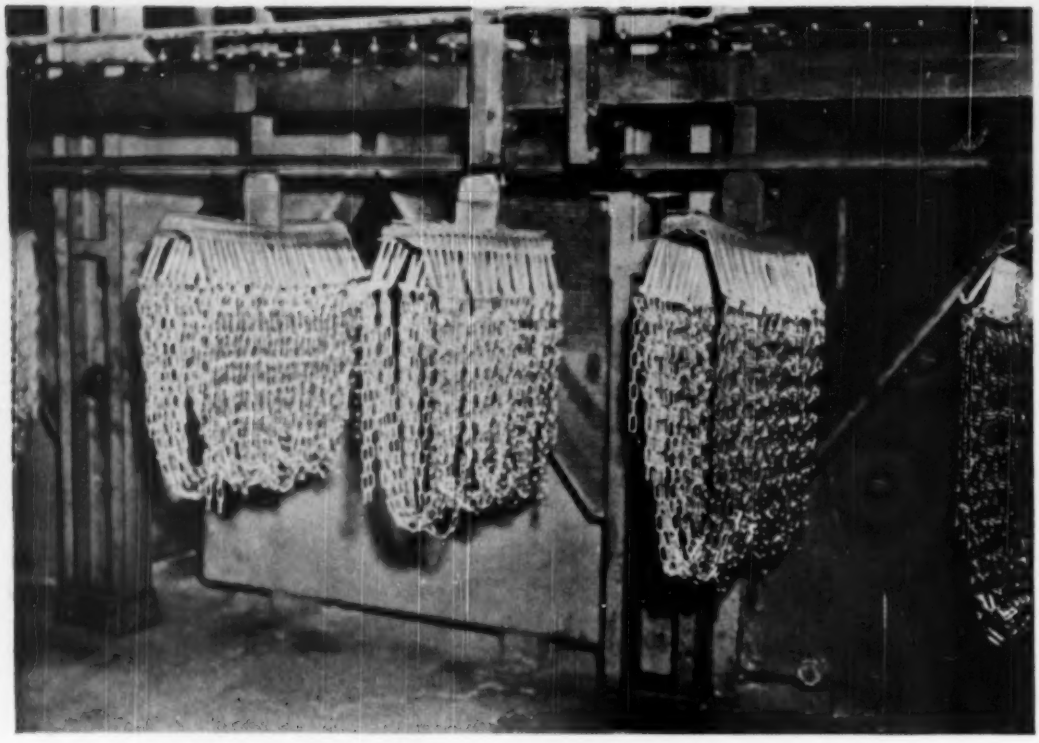
The liquid consists initially of a dilute (4 per cent) solution of sulfuric acid heated to insure rapid action on the scale. The operator periodically checks the degree of attack and, when the chain is clean, it is thoroughly washed with cold water. After washing, small quantities of soda ash and caustic soda are added to the tumblers, along with enough water to wet the chains thoroughly. These reagents serve the dual purpose of neutralizing the last vestiges of acid and inhibiting rusting until the electroplating operation can be performed. The solution is tumbled along with the chain until the entire charge has been wetted sufficiently, after which all liquid is ejected from the tumbler. Drying is accomplished by adding dry sawdust to the tumbler and rotating until all evidence of moisture has been removed from the work.

Up to this point only one major component of a tire chain, the cross chain, has been considered. The side chains, to which the cross chains are connected, are also important, and are made by the same general procedure as cross chains. The major differences between the two types of chain are that a cross chain is twisted, has a comparatively deep case depth and, in the better grades, includes a bar reenforcement, while a side chain is made with a slightly longer link that has a shallow case depth but does not possess any twist or reenforcement.

Side chains are cleaned for plating in an identical manner with that of cross chains. However, in the case of side chains, the cleaning is not as difficult, due to the simplified construction of the link. After cleaning, the side chains are transported to the finishing department for electroplating.

Plating

Both cross and side chains are plated in automatic machines, where the only human labor is in racking and unracking the chains.



Racking and unracking station at the rack-carrying chain encircling the full-automatic side-chain zinc plater

The side-chain plater electrodeposits a zinc plate from a cyanide-type bath, which imparts to the work a frosted silvery appearance. The side-chain plating racks are not detachable from the machine, and consequently racking is done while the empty racks return from the discharge end to the charging end of the straight-line plater.

Each rack supports the side chains in two places. The length of unsupported chain on each rack is critical, inasmuch as the point contact between adjacent links must carry the plating current.

Five racks move simultaneously through the operations performed by the plating machine, namely,

1. Spray washing
2. Immersion in alkaline cleaner
3. Cold-water rinse
4. Muriatic-acid dip
5. Cold-water rinse
6. Cyanide electrocleaning
7. Zinc plating
8. Cold-water rinse
9. Hot-water rinse
10. Hot-air drying

The thickness of plate is maintained at a value that provides ample protection under any conceivable storage condition; in service, of course, the plate is soon removed by the abrasive action of the ice and snow and of the sidewalk curbs on parking.

The cross chains are brass plated automatically, and in larger quantities than the side chain. In this plating machine, the plating racks are removable and easily transported for racking in a separate department. After racking, the racks are hung on fixtures, which in turn are carried by electric trucks to the charging end of the electroplater. Since this plating machine is of the return type, a small crew of men is capable of handling both the loading and unloading of the machine.

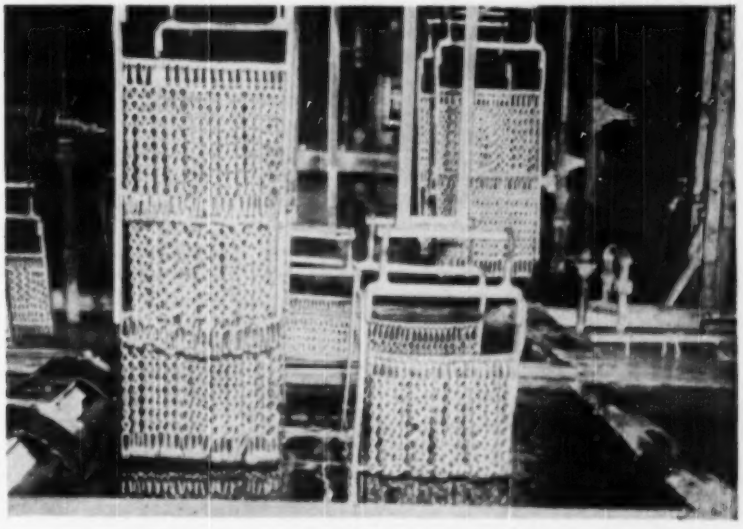
The treatments in this double-row plating machine are very similar to that in the zinc plater previously discussed. The operations include:

1. Alkaline cleaning
2. Cold-water rinse
3. Muriatic-acid dip
4. Cold-water rinse
5. Cyanide electrocleaning
6. Cold-water rinse
7. Brass plating
8. Cold-water rinse
9. Hot-water rinse
10. Hot-water rinse
11. Hot-air drying

The standard cyanide brass plating solution is used, with appropriate ammonia additions as required to maintain a true brass-colored deposit.

As the racks are discharged from the plater, it is the function of the tank men to remove them from

View from racking and unracking end of return-type full-automatic brass plater for cross chain. To the left, belt conveyor carrying plated chain to top of gravity-type sawdust dryer



Transfer station on return-type automatic brass plater. Detail on cover

Machine for attaching cross chains to side chains, completing the tire chain

the plating machine, to disengage the plated chain from the racks, and to deposit them on an inclined conveyor. This conveyor carries the work to the top end of a rotating tilted wooden barrel, into which passes a continuous supply of dry sawdust. As gravity moves the work down through the barrel, it receives a short tumble in the dry sawdust, which eliminates all traces of water and imparts a slightly burnished appearance to the chain.

It should be noted that electroplating serves the primary functions of promoting sales appeal and providing shelf life. Attempts to provide the cross chains with permanent corrosion protection have proved fruitless due to the abrasion to which they are subjected in service.

Assembly

After plating, both the cross chain and side chain are ready for assembly into a completed tire chain. In this operation the cross chains are connected to the side chains in an evenly spaced pattern, appropriate to the tire size for which they were designed. Assembly is carried on in a specially built conveyor-type machine, where operators engage the cross chain into the side chain by the use of connecting hooks. The connecting hooks are automatically closed, thus firmly attaching the cross and side chains together. End hooks are then applied to one end of each side chain, and the finished tire chain is deposited by the conveyor into its container ready for shipment.

Inspection

Inspection methods have, by virtue of their lengthiness, been omitted from this discussion. However, inspection is perhaps the most important of any of the operations in chain fabrication. It is inspection that guides the materials from the time of its acceptance into the plant until its ultimate release as the completed product. It insures the product of pleasing appearance and contrast by controlling the degree of color variance in plating, and finally, it insures each customer of procuring a pair of tire chains that will give satisfactory service.

Grain Orientation in Nickel Plate As Related to Brightness

an x-ray diffraction study

WILLIAM SMITH*, JAMES H. KEELER* and HAROLD J. READ†

Introduction

It has been recognized that the relative brightness of electrodeposited metals is influenced by plating variables such as current density, temperature, *p*H of the bath, chloride concentration in the bath, thickness of the deposit, basis metal orientation, and many others. These variables are interrelated and their influences are difficult to separate and identify. An explanation has been given that a very small crystal size, as influenced by the above variables, is necessary for bright deposits. This may not always hold true as shown by P. Jacquet[1], who produced extremely bright surfaces on course-grained electrodeposits by "anodic polishing". Many authors have expressed the opinion that brightness results from a preferred orientation of the electrodeposit.

The presence of a fibered‡ or oriented structure in various electrodeposits has been shown. Preferred orientation has been reported for zinc by A. Rubio[2] and L. Patanik[3], for cadmium by L. Patanik[3], and for chromium by W. A. Wood[4]. Similar findings have been made by J. W. Cuthbertson[5] for copper deposits. Electrodeposits of nickel may also exhibit preferred orientation or fibering as indicated by W. G. Burgers and W. Elenbass[6], K. Frolich[7], W. G. Burgers and H. E. Quanjel[8], and W. A. Wood[9].

G. Tammann and H. Jaackes[10] stated that electrodeposits of metals are usually found as fibers perpendicular to the cathode surface. Similar results for nickel were also reported by J. W. Cuthbertson[5].

Experimental evidence has been reported which supports the belief that orientation is a major factor in yielding bright deposits. A. Rubio[2] reports that an increase in the preferred orientation of zinc deposits is accompanied by an increase in the brightness. Similar results were found for cadmium and zinc electrodeposits by L. S. Patanik[3] and for zinc by G. F. Kosolapov and B. Mett[11], and H. Fischer and H. Bärmann[12]. W. A. Wood[4] and W. Hume-Rothery and M. R. Wyllie[14] showed that bright coatings of chromium were associated with highly oriented structures, and conversely, dull deposits were found with random orientation. W. A. Wood[13] showed similar findings for nickel deposits. A. W. Hothersall and G. E. Gardam[15] reported random orientation and preferred orientation in various bright nickel deposits.

One of the theories advanced on the action of substances which are added to the plating bath to in-

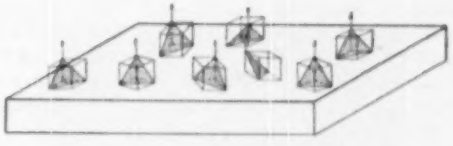


Fig. 1. A typical fiber structure of electroplated material showing the arrangement of deposited crystals on the basis metal. The arrows represent both the direction perpendicular to the basis metal and the fiber axis (001) direction. The shaded planes (111) intercept the plane of the basis metal at a definite angle but can be rotated with respect to the fiber axis

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†Associate Professor of Metallurgy, The Pennsylvania State College, State College, Pennsylvania.
‡The term "fiber" is used in regard to plated materials in the same sense as in wire drawing textures which resemble the structure of fibrous materials, the long axis of the crystals being parallel to the drawing direction. If the electrodeposited grains tend to align themselves in particular directions a "fibered" structure results. The axis of symmetry of the texture is the fiber axis. (See Fig. 1).

TABLE I. PLATING CONDITIONS AND BRIGHTENERS

Bath composition: 42 oz/gal single nickel salts, $NiSO_4 \cdot 6H_2O$; 6 oz/gal nickel chloride, $NiCl_2 \cdot 6H_2O$; 5 oz/gal boric acid, H_3BO_3
Plating conditions: pH 4.0; temperature, 140° F; current density, 50 asf; thickness of deposit, 0.0025 inch
Panel preparation: electropolished bumper stock

Panel	Addition Agent
NAX	None
A-2	0.2 g/l saccharin
A-4	0.4 g/l saccharin
A-6	0.6 g/l saccharin
B-2	0.2 g/l 1–5, naphthalene disulfonic acid
B-4	0.4 g/l 1–5, naphthalene disulfonic acid
B-6	0.6 g/l 1–5, naphthalene disulfonic acid
B-8	0.8 g/l 1–5, naphthalene disulfonic acid
B-10	1.0 g/l 1–5, naphthalene disulfonic acid
C-2	0.2 g/l p-toluene sulfonamide
C-4	0.4 g/l p-toluene sulfonamide
C-6	0.6 g/l p-toluene sulfonamide
C-8	0.8 g/l p-toluene sulfonamide
C-10	1.0 g/l p-toluene sulfonamide
D-2	0.2 g/l m-benzene disulfonic acid
D-4	0.4 g/l m-benzene disulfonic acid
D-6	0.6 g/l m-benzene disulfonic acid
E-2	0.2 g/l 2–7, naphthalene disulfonic acid
E-4	0.4 g/l 2–7, naphthalene disulfonic acid
E-6	0.6 g/l 2–7, naphthalene disulfonic acid
E-10	1.0 g/l 2–7, naphthalene disulfonic acid
F-1	1.0 g/l Zn plus 0.6 g/l 1–5, naphthalene disulfonic acid
F-2	1.0 g/l Zn plus 1.0 g/l 1–5, naphthalene disulfonic acid
H-1	0.2 g/l chloralhydrate plus 0.6 g/l 1–5, naphthalene disulfonic acid
H-2	0.2 g/l chloralhydrate plus 1.0 g/l 1–5, naphthalene disulfonic acid
H-3	0.6 g/l chloralhydrate plus 1.0 g/l 1–5, naphthalene disulfonic acid
K-1	2.5 g/l formaldehyde plus 0.6 g/l 1–5, naphthalene disulfonic acid
K-2	2.5 g/l formaldehyde plus 1.0 g/l 1–5, naphthalene disulfonic acid
L-1	15.0 g/l Ni-formate plus 0.6 g/l p-toluene sulfonamide
L-2	30.0 g/l Ni-formate plus 0.6 g/l p-toluene sulfonamide
N-1	0.2 g/l chloral hydrate plus 0.6 g/l p-toluene sulfonamide
N-2	0.6 g/l chloral hydrate plus 0.6 g/l p-toluene sulfonamide
O	2.5 g/l formaldehyde plus 0.6 g/l p-toluene sulfonamide

crease the brightness of the electrodeposit is that the agents encourage preferred orientation as discussed by W. Blum, A. O. Beckman, and W. R. Meyer[16], and L. Patanik[3]. Codeposition of the metal and a foreign substance may greatly influence orientation and perhaps in such a manner control brightness. This belief has been expressed by W. R. Meyer and A. Phillips[17] in regard to metals acting as brightening agents.

For this investigation of the relationship between brightness and orientation of the electrodeposits, specimens were obtained which had been prepared* in a plating bath of constant composition and with plating conditions held as nearly constant as possible. The only variable was the substance added to influence brightness. Commonly accepted practice was followed to purify the nickel bath. The *p*H was raised with nickel carbonate and the solution was heated with agitation for at least four hours. Peroxide was added prior to heating to insure oxidation of any iron present. Activated carbon was added during the heating period to remove any organic matter. The bath was then filtered using filter aid, and the volume and *p*H were adjusted to the desired operating values. Plating conditions typical of commercial procedures were used. (See Table I.) In order to minimize the complicating features of preferred orientation in the basis metal, hot-rolled bumper stock was employed and was electropolished rather than mechanically polished to avoid possible orienting effects, i. e., to avoid continuing into the deposit an oriented structure caused by directional flow of metal during mechanical polishing. (T. Voyda[18], G. I. Finch and A. L. Williams[19], W. Blum and H. S. Rawdon[20], A. W. Hothersall[15] and others have reported that the basis metal influences the structure of the electrodeposit.) The hot-rolled stock itself was free of preferred orientation.

*See acknowledgment at end of paper.

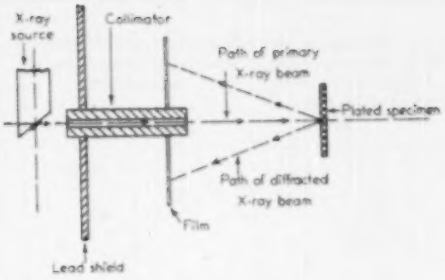

Fig. 2. Schematic drawing of back-reflection X-ray setup

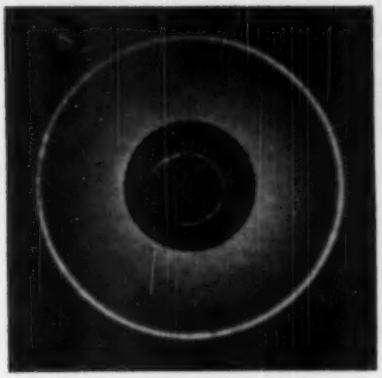

Fig. 5. Specimen A6, typical of those patterns showing no inner ring

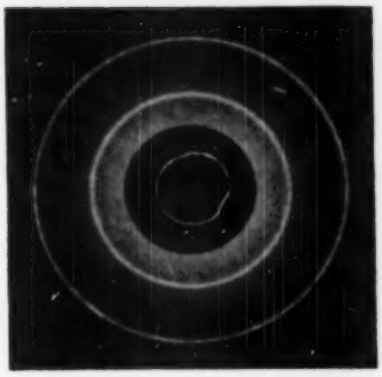

Fig. 3. Cold-rolled nickel sheet annealed at 1525° F for 45 minutes to obtain recrystallization and random orientation. Film was rotated to obtain circle patterns for line density measurements

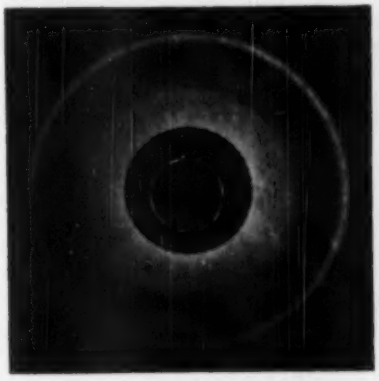

Fig. 6. Specimen H2, typical pattern of a bright nickel plate showing line densities similar to NAX (dull nickel)

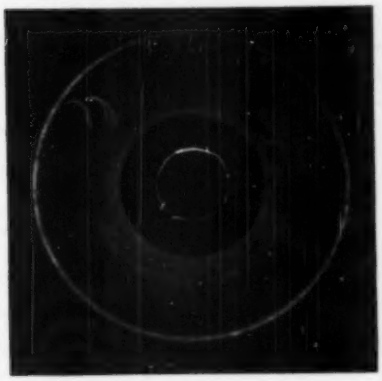

Fig. 4. Specimen NAX. Plating bath did not contain a brightening agent

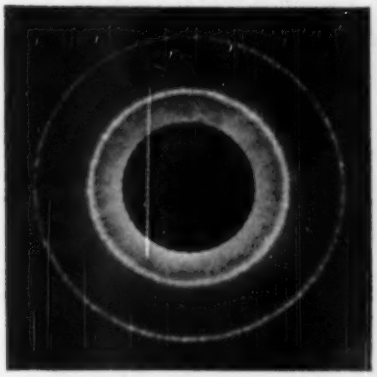

Fig. 7. Specimen D2, typical of those patterns showing an inner ring of greater density than the outer ring

TABLE II. RELATIVE ORDER OF BRIGHTNESS vs. LINE DENSITY RATIO

Relative order of brightness as determined by visual examination	Relative density of inner to outer ring on X-ray film* $R = \frac{I \text{ density}}{O \text{ density}}$	List of specimens according to increasing line density ratio as estimated by eye	Relative order of brightness as measured by reflectometer
NAX (dullest)	0.13	C-10	NAX (dullest)
D-6	1.1	C-8	D-6
A-2	0.0	A-2	A-2
A-6	0.0	A-4	A-6
B-2	1.4	A-6	C-4
D-4	1.4	E-10	B-2
D-2	1.7	N-2	H-2
C-2	1.7	H-3	C-6
C-4	1.25	NAX	C-2
B-6	2.0	H-2	L-1
C-6	1.4	D-6	D-4
L-1	1.25	N-1	D-2
E-10	0.0	L-2	B-6
A-4	0.0	L-1	E-10
B-4	2.0	H-1	N-1
L-2	1.4	B-10	A-4
E-4	2.5	E-6	B-4
E-6	2.0	K-1	C-10
B-8	2.0	K-2	L-2
K-1	1.4	O	C-8
C-10	0.0	C-6	H-1
O	1.7	C-4	E-4
E-2	2.5	E-4	E-6
K-2	1.4	E-2	E-2
C-8	0.0	B-8	B-10
B-10	1.25	B-4	H-3
F-2	2.5	Annealed Ni Sheet	O
H-2	1.25	D-4	B-8
H-3	1.4	F-1	F-1
H-1	1.7	B-6	N-2
F-1	2.5	C-2	K-1
N-1	1.25	F-2	K-2
N-2 (brightest)	1.4	B-2	F-2 (brightest)
Annealed Ni Sheet	1.4	D-2	....

*Reciprocal of transmission values.

It was realized that the plating conditions selected for this investigation were arbitrary and that it might be possible to produce greater or lesser degrees of orientation with a given brightener under other conditions. However, the complexity of such a comprehensive investigation was considered prohibitive under present circumstances, and by holding the many plating variables constant, useful information was obtained.

It is to be emphasized that the value of this investigation stems from the large number of specimens investigated in which the only variables were the brightener and its concentration. Conclusions could be drawn from portions of the test results which would be entirely contrary to conclusions reached from the results as a whole.

Experimental Methods and Results

The back-reflection method of X-ray analysis was used to determine the crystal structure of the electrodeposited nickel. The relative positions of the specimen, X-ray beam and film are shown in Fig. 2. For comparison purposes a back-reflection diffraction pattern of an annealed, cold-rolled nickel sheet was obtained. It can be assumed that this material has a comparatively low degree of fibering since the annealing was done at a sufficiently high temperature to insure recrystallization. Several different types of

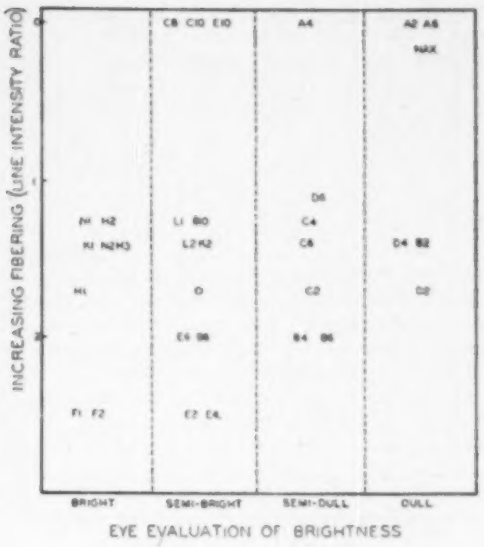

Fig. 8. Graphical representation of the relationship found between the degree of fibering (preferred orientation) and brightness of the plate as measured by the eye. The very poor correlation is easily seen

patterns obtained from the various specimens by using this X-ray technique are shown in Figs. 3–7. In order to interpret these patterns completely it was necessary to conduct a fiber pattern study and to determine the degree of fibering and fiber axis. A subsequent publication will deal with the calculations and techniques involved.

Since a relative measure of the degree of fibering can be ascertained from a comparison of ratios of intensity of the lines on the x-ray pattern, the densities of these lines were measured. An ARL Dietert densitometer such as is used to measure the density of lines on a spectographic plate for chemical analysis was employed for this purpose. This densitometer measures transmission intensity rather than actual line density. In order to obtain a roughly quantitative measure of line densities reciprocals of the values obtained were used. Relative line intensities were also estimated visually. Because of scatter and secondary radiation, it was very difficult to evaluate some of the films; however, no matter which method is used to measure the relative line densities of the films, the conclusions reached are the same.

The results obtained for the various electrodeposits and the annealed sheet are given in Table II. In this table the lower the value of the ratio, R, the greater will be the extent of preferred orientation or fibering. The truth of this statement has been adequately tested by the determination of pole figures for selected specimens. The diffraction patterns and drawings involved in the pole figure determinations are not reproduced here because of the large number of figures which would be required (10 to 12 per specimen). In general, the pole-figure work followed established practice.

It was recognized that in order to compare the degree of fibering (as measured by the line-density ratios) to the brightness of the plates it would be highly desirable to find a means of measuring the relative brightness of the nickel plated specimens which would avoid any human errors in a purely visual examination. A Hunter Multipurpose Reflectometer which is used to measure spectral gloss and reflectance of vitreous enamels, paints, lacquers and other nonmetallic materials was adopted for this purpose. It was not possible to alter this apparatus so that scale readings for both the dullest and brightest deposits

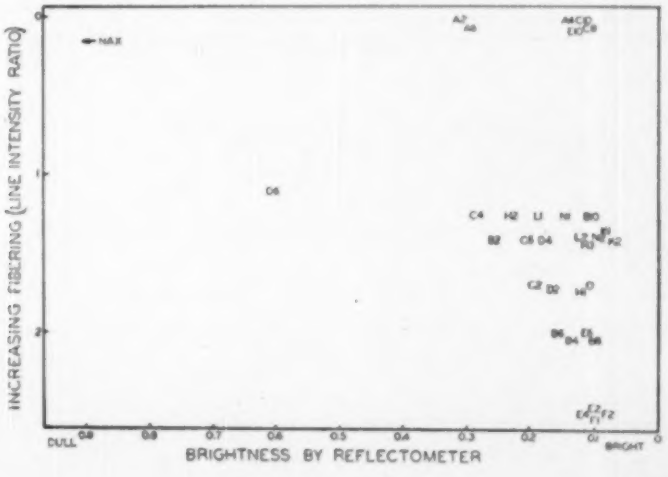

Fig. 9. A representation similar to that of Fig. 8 except that brightness was measured with the reflectometer. Again poor correlation is shown

could be obtained; however, by omitting the specimen which contained no brightening agent (NAX), which was by far the dullest, it was possible to obtain satisfactory readings for all other specimens. Comparative measurements of the brightness were made by this method, and a decreasing scale reading was taken to indicate increasing brightness. A visual examination for brightness was made by the authors, and the results obtained by both methods are given in Table II. A comparison of the data will show several very bad discrepancies, which confirms the statement made by W. Blum, A. O. Beckman and Walter R. Meyer[16] that "It is apparently not possible to measure or express the brightness of a surface completely by any simple system, but useful comparisons can be made." Since brightness evaluation other than by visual means was not an absolute necessity for this work no further attempt was made to measure brightness.

Discussion

Each group of X-ray patterns for specimens A through O was tested for confirmation (see Table II) of the following statements:

1. Increasing amounts of a particular brightener, in the concentrations considered, increased fibering (preferred orientation).

Affirmative		Negative		No Change	
Eye	Densitometer	Eye	Densitometer	Eye	Densitometer
B	C	F	B	A	A
C	D	K	H		F
D	E		L		K
E			N		
H					
L					
N					

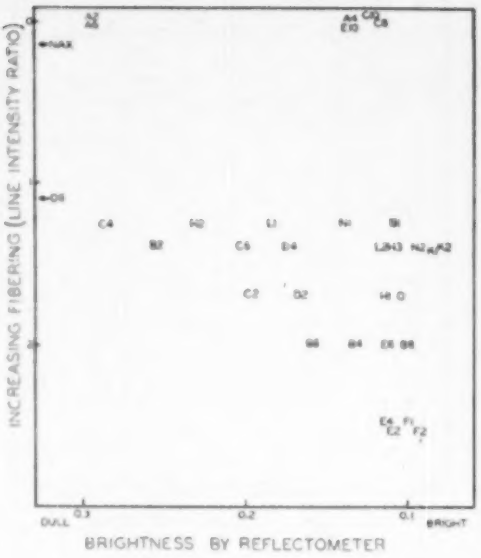

Fig. 10. An enlargement of the right portion of Fig. 9

2. Increasing amounts of a specific brightener increased the brightness.

Affirmative	Negative
B	A
C	D
L	E
N	F
K	H

3. Increased fibering as determined by the line densities, in a particular group, accompanied increases in the brightness.

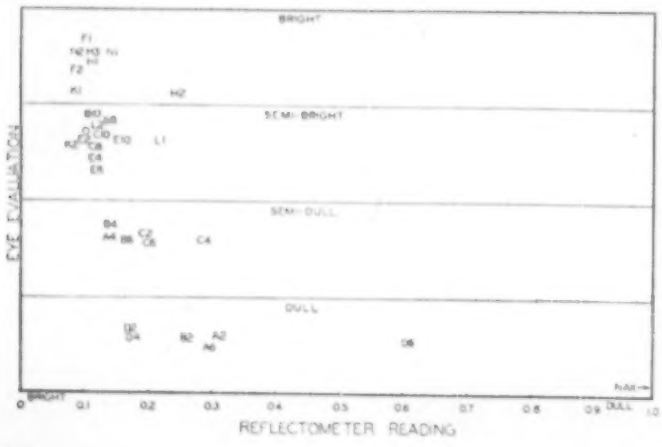

Fig. 11. Graphical representation of the correlation between the two methods of measuring brightness of the electrodeposit. Although a general trend can be observed, certain specimens (for example: H2, L1, D2, D4) display wide variations

Affirmative		Negative		No Change	
Eye	Densitometer	Eye	Densitometer	Eye	Densitometer
B	C	D	B	A	A
C		E	D	L	F
N		F	E		K
		H	H		
		K	L		
			N		

Only six of the thirty-three specimens tested had a greater perfection of the fiber structure (more preferred orientation) as measured by the densitometer than did the dullest specimen, NAX, which contained no brightener. Eye evaluation of the X-ray patterns indicates eight specimens had a higher degree of fibering.

The results given in Table II have been plotted in Figs. 8 to 10 which illustrate very clearly that there is no correlation between fibering and brightness. Fig. 11 shows the correlation between eye evaluation and reflectometer readings for brightness.

Summary

The results of this study show quite clearly that there is no over-all relation between preferred orientation (fibering) and the brightness of nickel plate under the conditions considered in this investigation. It is entirely possible to have as high a degree of fibering in a very dull deposit as in a bright one or to have practically any degree of fibering in both bright and dull deposits.

It can be seen that it would be possible, by considering a specific set of specimens, to arrive at entirely different conclusions, but on viewing the data as a whole it is only possible to come to the above conclusions.

Acknowledgment

The specimens used in this investigation were furnished by Dr. A. K. Graham and Mr. H. L. Pinkerton of Graham, Crowley and Associates, Inc., Jenkintown, Pa. A part of the experimental work was done as a laboratory problem in a course in atomic structure given by Dr. T. F. Bates. Dr. E. P. Klier provided valuable assistance in planning the x-ray experiments and interpreting the results.

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a. e. s. research project no. 6

Porosity of Electrodeposited Metals

IV. MEASUREMENT OF VERY LOW POROSITIES BY THE LOW PRESSURE-CONSTANT OVERPRESSURE METHOD

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Acknowledgment is due the Research Committee, Dr. Louis Weisberg, Consulting Chemist, New York City, Chairman; the Research Directing Committee, Mr. William M. Tucker, Eastman Kodak Company and Dr. W. A. Wesley, The International Nickel Company, Chairman and Vice-Chairman, respectively; and the Project Committee, Dr. W. A. Wesley, Chairman; Dr. B. Egeberg, International Silver Company, and Mr. A. Mendizza, Bell Telephone Laboratories, Inc., for their contributions to this project.

*Abstract**

In this report is demonstrated that the crystal structure of nickel deposits can have a profound effect on their intrinsic porosity, i. e., porosity which has been shown to be present in deposits free from visible pores and pits. For example, a 0.0005-inch nickel deposit from a cold nickel sulfate-boric acid bath with one type of preferred orientation of its grains was found to be definitely permeable, whereas a deposit of the same thickness and from the same bath run warm, which had a different type of preferred orientation, showed no permeability in the same test.

A direct comparison of special wrought nickel foils 0.0001 inch thick with electrodeposited foils of the same thickness showed no trace of intrinsic porosity in the former while the latter were highly porous.

These results were obtained by means of a newly devised technique, the constant over-pressure method, which is described. It is shown that the permeability constant, which is the numerical measure of porosity, is the same whether calculated by the constant over-pressure method or the previously reported low-pressure equalization method.

The low-pressure gas permeability method described in Part III of this series[1], which makes use of initial overpressures of the order of 10^{-1} mm mercury and consists in the measurement of the rate of equalization of pressure on both sides of the metal foil, is sensitive only to permeabilities corresponding to "standard half-times" of the order of up to $10^{3} - 10^{4}$ minutes. With foils of substantially lower porosity, equalization of pressure is much too slow to permit a "half-time" to be extrapolated; in fact, porosity cannot even be detected. For the purpose of detecting and of determining very slight permeabilities, particularly in thicker foils, we have developed an alternative method which, as will be shown in the following, supplies the same characteristic permeability constant as the method previously described.

The basic differential equation of the rate of pressure equalization is

$$\frac{d\Delta p}{dt} = -\frac{F}{V/2} \times k \times \Delta p \qquad (1)$$

where p = pressure difference at time t
F = exposed surface area of the gas-permeable foil
V = volume, equal on both sides

If in this equation the pressure difference Δp is very large compared with the initial pressure and the pressure increase p on the low-pressure side and therefore can be considered practically constant and equal to the initial overpressure Δp_o, one can write (bearing in mind that $-d\Delta p = -d(\Delta p_o - 2p) = +2dp$),

$$+2\frac{dp}{dt} = \frac{F}{V/2} \times k \times \Delta p_o \qquad (2)$$

*By the Editor.

and, integrated

$$p = \frac{F}{V} \times \Delta p_o \times k \times t \qquad (3)$$

whence

$$k = \frac{V}{F} \times \frac{1}{\Delta p_o} \times \frac{p}{t} \qquad (4)$$

where p is the increase of pressure on the low-pressure side at time t.

If, on the other hand, the initial overpressure Δp_o is small and decreases as the pressure on the low-pressure side increases, one has, from equation (1),

$$-\frac{d\Delta p}{\Delta p} = \frac{2F}{V} \times k \times dt \qquad (5)$$

and, integrated and converted to decimal logarithms,

$$\log \frac{\Delta p_o}{\Delta p} = \frac{2F}{2.303V} \times k \times t \qquad (6)$$

Designating, as was done in our previous communication, $t_{0.5}$ the "half-time" at which

$$\frac{\Delta p_o}{p} = 2 \text{ and } \log \frac{\Delta p_o}{\Delta p} = 0.3010,$$

one has

$$k = \frac{2.303 \times 0.3010 \times V}{2F} \times \frac{1}{t_{0.5}} \qquad (7)$$

Equation (7) gives the permeation rate constant k in liter/sq.cm-minute by our previous method, which henceforth will be referred to as the "low-pressure equalization method" and which consists, practically, in measuring the pressure increase on the low-pressure side and the pressure decrease on the over-pressure side and then determining $t_{0.5}$.

Equation (4)* permits evaluation of k, of the same dimension, by the alternative method, henceforth to be referred to as the "low pressure-constant overpressure method", wherein the overpressure is large and kept constant. It consists simply in measuring the pressure increase p on the low-pressure side at time t.

When conveniently large Δp_o is used, the latter method gives comfortably measurable pressure increases with foils which fail to give, within reasonable periods of time, an observable effect with the low-pressure equalization method. It is thus applicable to foils of very low permeabilities. Since such foils as a rule are of considerable thickness and consequently have a much higher mechanical strength than the thin foils tested by the low-pressure equalization method, application of a constant Δp_o of the order of a fraction and up to one atmosphere meets no practical objection.

Equivalence of the Two Methods

It remains to be demonstrated that the constant k in equations (4) and (7) is the same constant, in other words that k is independent of the overpressure in the whole pressure range extending from 10^{-4} to 10^{2} mm Hg. This is conveniently tested by comparing the ratio of the initial rates of pressure increase on the low-pressure side with the ratio of the overpressures applied. At the initial stage, equation (1) reduces to

$$v_o = +\left(\frac{dp}{dt}\right)_o = \frac{F}{V} \times k \times \Delta p_o \qquad (8)$$

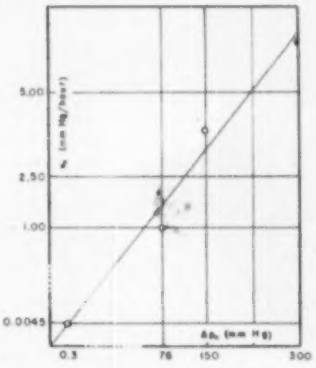

Fig. 1. Demonstration of the constancy of k in the overpressure range of 0.3-300 mm mercury, shown by the constant ratio of initial rate v_o of pressure increase on the low pressure side and initial overpressure Δp_o on the high pressure side of the foil

where $v_o = \left(\frac{dp}{dt}\right)_o$ is the initial rate of increase of pressure. Obviously, if k remains unchanged, then, with fixed F and V, the initial rates should be proportional to the initial overpressures.

The practical problem was to obtain a foil susceptible of being tested in a sufficiently wide range of Δp_o. Such a foil could not be obtained as a primary product of electrodeposition, on one hand because thin electrodeposited foils of permeabilities that are comfortably measurable with the low-pressure equalization method could not be exposed without damage to high overpressures and, even if they could, the rate of permeation would be too rapid for measurement, and on the other hand, because thick electrodeposited foils give no measurable effect with low over-pressures. A suitable sample could, however, be obtained by subjecting a thick electrodeposited foil, originally impermeable even with the low pressure-constant overpressure test, to beginning corrosion. Specifically, a 25-micron (0.001-inch) thick electrolytic nickel foil produced in a sulfate bath at 60° C, after having been exposed for 10 days to a moist atmosphere containing 6 mol-per cent sulfur dioxide, proved to have attained the necessary degree of permeability to air *without showing any visible signs of corrosion or perforation.* This foil had undergone what we propose to term "hidden initial corrosion" which precedes gross visible or ponderable corrosion and can be detected only by an increase of permeability to a gas. This foil was tested comfortably with overpressures ranging from 0.3 to 300 mm Hg. Fig. 1 shows the straight-line plot of the observed initial rate of permeation as a function of the initial overpressure.

The proportionality between Δp_o and v_o is thus confirmed, within the limits of experimental accuracy and the uncertainty involved in extrapolation, in a pressure range in which Δp_o was varied 1000 fold. The constant k is thus proved to be independent of the overpressure in that range. Consequently, the two methods, the low-pressure equalization

(Continued on page 366)

*Equation (4) can also be derived directly from (1), integrated to $\ln \frac{\Delta p_o}{\Delta p} = \frac{2F}{V} kt$. Since $\Delta p = \Delta p_o - 2p$, one has

$$\ln \frac{\Delta p_o}{\Delta p} = -\ln \frac{\Delta p}{\Delta p_o} = -\ln \left(1 - \frac{2p}{\Delta p_o}\right), \text{ and, if } \frac{2p}{\Delta p_o} < 1,$$

using the well-known approximation formula,

$$\ln \frac{\Delta p_o}{\Delta p} = \frac{2p}{\Delta p_o}. \text{ Hence, } \frac{2p}{\Delta p_o} \times \frac{2F}{V} = kt, \text{ and } k = \frac{V}{F} \times \frac{1}{\Delta p_o} \times \frac{p}{t} \qquad (4)$$

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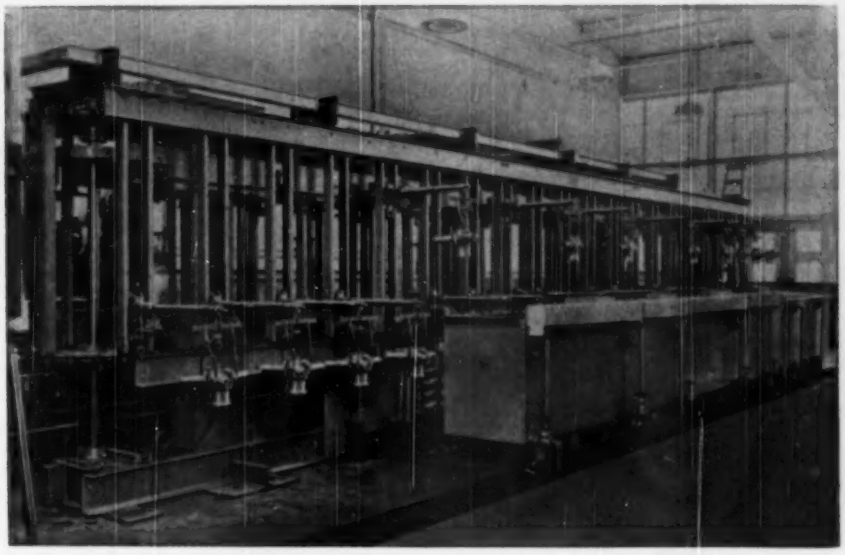

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Porosity

(*Continued from page 365*)

and the low pressure-constant overpressure method, can be used at will depending on which is suitable for the given degree of permeability.

Porosity and Crystal Orientation of Deposits

It has been shown by one of us[8] that nickel deposits produced in a bath of $NiSO_4$ $6H_2O$ 240 *g/l*, H_3BO_3 30 *g/l*, *p*H 2.4, at 2 amp/dm² (19 asf) and 29° C (68° F) are predominantly oriented with the (110) crystal faces parallel to the base surface, while the predominant orientation in nickel produced in the same bath at the same current density but at 60° C (140° F) is with the (100) faces parallel to the base. In order to ascertain a possible relation between the crystal orientation and the porosity of the deposit, tests had to be made on relatively thick deposits, as the orientations are only sufficiently developed at adequate thicknesses. Electrolytic nickel foils 12-microns (0.0005-inch) thick produced so as to give the two above-named crystal orientations, failed to show any permeability by the low-pressure equalization method, but a distinct difference was revealed by the low pressure-constant overpressure method with Δp_0 = 760 mm Hg. In this test, the (100) deposit still proved to be definitely impermeable, no change of pressure having occurred in several hours, but with the (110) foil the low pressure rose from 0.001 to 0.1 mm mercury in 2 hours, which gives for this foil $T_{0.5} = 1/k = 6.4 \times 10^9$ minute-sq.cm/liter. It is thus shown that the orientation (110) produces distinctly higher porosity than the orientation (100). This was further corroborated by a test on a 5-micron (0.0002-inch) (110)-nickel foil which proved to be not only highly porous but also distinctly pinholed in strong transmitted light so as to render the half-time determination ($t_{0.5}$ less than 20 minutes) illusory. It will be recalled that the electrolytic nickel foils reported in Part III of this series had, at that thickness, a $t_{0.5}$ of the order of 240 minutes ($1/k$ = 500); those deposits, produced as they were in warm baths, had evidently a predominant (100) orientation.

Wrought Nickel Foils

Having established the intrinsic porosity of electrolytic deposits and its systematic decrease with increasing thickness, we naturally became interested in analogous tests with wrought foils of comparable thicknesses. A very welcome opportunity was provided by the recent development in the Bell Telephone Laboratories of a technique permitting production of *undamaged* rolled nickel foils as thin as 2.5 microns (0.0001 inch). Specimens of such foils, kindly put at our disposal by A. Mendizza, were first degreased and then tested with overpressures Δp_0 gradually increased from 0.3 to 10 mm Hg, without showing any sign of permeability. It will be recalled that our best electrolytic nickel foils of that thickness were always exceedingly permeable, lying at about the lower limit of the thickness at which permeability determinations with the low-pressure equalization method could be made at all. We cannot but conclude that, at equal thickness, *sound* wrought nickel foils are incomparably less porous than the best electrolytic foils which we could produce or had at our disposal.

Further applications of the low pressure-constant pressure method, particularly to the study of the initial "hidden" corrosion of foils, will be reported in a following communication.

Acknowledgment

We take pleasure in acknowledging with thanks the lively interest taken in this work by Dean Hugh S. Taylor, Chairman of the Department of Chemistry of Princeton University, and his constant help.

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1. N. Thon and Denis Kelemen, "Porosity of Electrodeposited Metals. III. Measurement of Intrinsic Porosity", Plating **35**, No. 9, 917 (1948).

2. G. I. Finch, H. Wilman and L. Yang, "Crystal Growth at the Cathode", Trans. Faraday Soc. **43**, 144 (1947).

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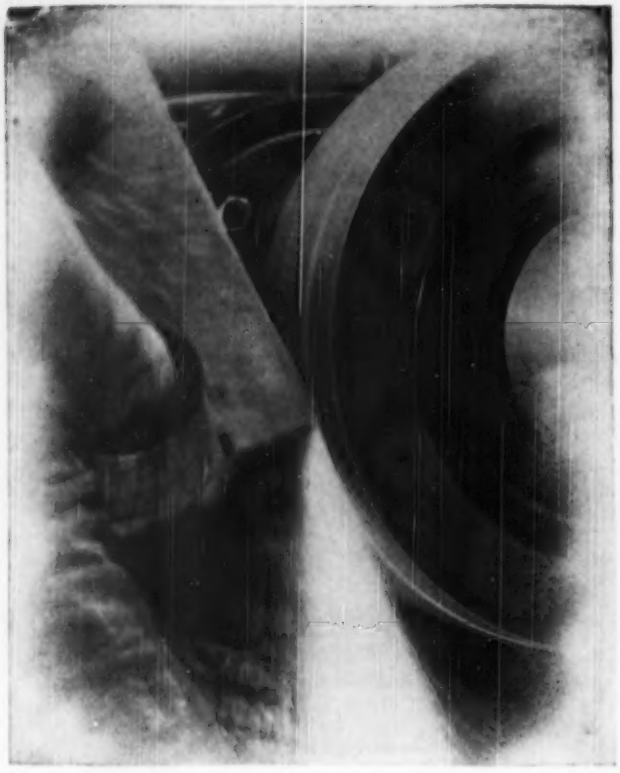

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Book Review

DR. HAROLD J. READ

Associate Professor of Metallurgy, Pennsylvania State College

INDUSTRIAL HEALTH ENGINEERING by Allen D. Brandt, 1947, viii + 395 pages. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. Price, $6.00.

This book occupies in an extremely satisfactory fashion a hitherto unfilled niche in the technical literature. Although satisfactory reference texts are available on some aspects of health engineering, e. g., ventilation and heating, there has been no adequate treatment of the subject on a broad, general basis. Dr. Brandt has set out to provide a practical summary of information and data needed to determine when health hazards exist, and to design control equipment to eliminate them. He has accomplished this objective in an admirably written book which contains a vast amount of information that has been skillfully condensed without loss of clarity.

The first three chapters are concerned with the more general aspects of industrial hygiene, namely, the nature and recognition of health hazards, and the principles of control. The next eight chapters deal in a comprehensive fashion with the subject of ventilation. After presenting the basic fundamentals of design and describing the equipment available, the author turns his attention to many specific problems which nicely illustrate the technique of practical design. Some of the examples are directly concerned with plating operations, e. g., tank ventilation and grinding dust removal. The remaining six chapters are devoted to other specialized aspects of industrial hygiene, such as respirators and protective clothing, illumination, noise, sanitation and radiant energy. References are made at appropriate points in the text to a bibliography of 221 items which immediately precedes an appendix of useful miscellaneous data.

A noteworthy amount of design data has been incorporated into the book in the form of tables and graphs, and there are many line drawings and photographs which are valuable adjuncts to the text. Although some mathematical expressions are employed, the book is essentially descriptive, and in any case, only a knowledge of simple algebra is required to utilize the formulae which are given.

This volume should prove to be very useful to anyone who is charged with any task or responsibility relating to health engineering in industry whether it be in actual designing or in checking the designs of someone else to judge their adequacy for the problem at hand.

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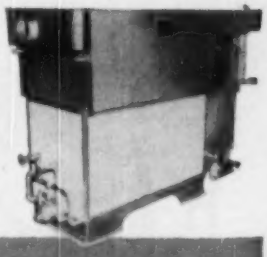

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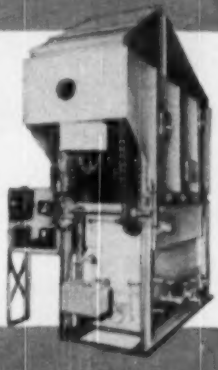

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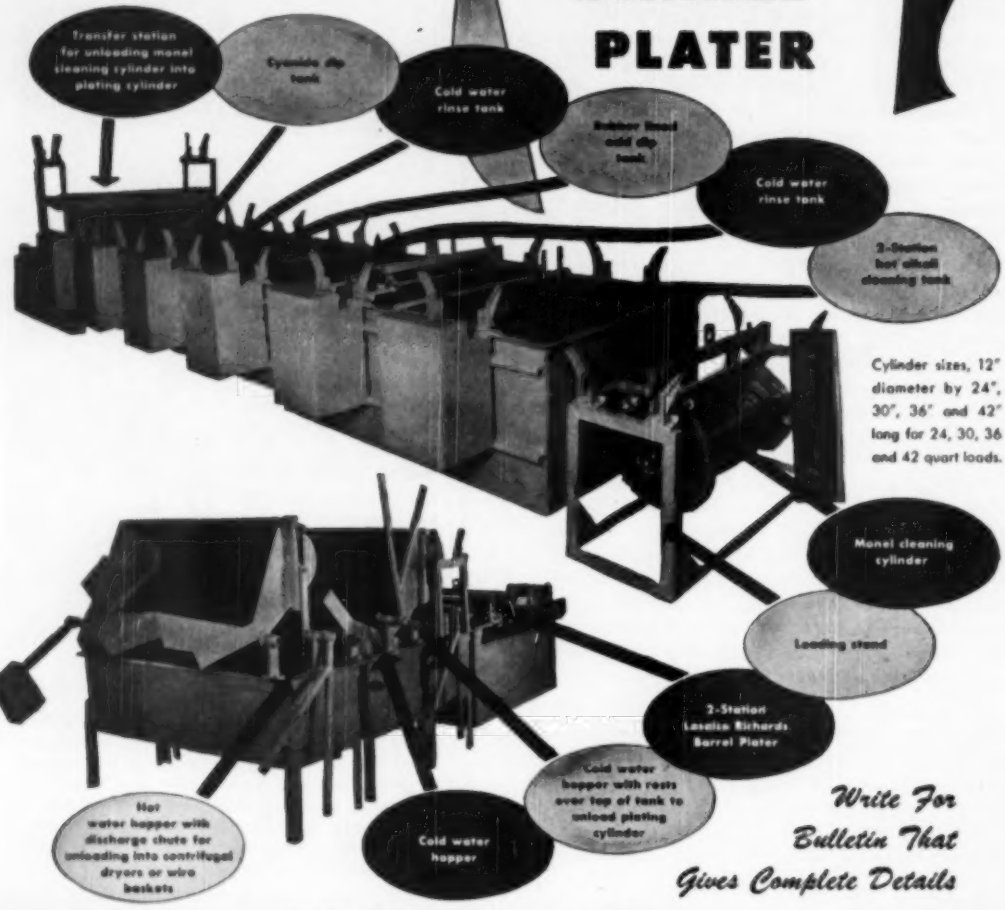
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Q. 47. What method can be used to zinc plate coil springs without hydrogen embrittlement? We clean mechanically to avoid acid pickling, but the springs are still brittle.

A. It should be understood that in the writer's experience the best procedure for rustproofing steel springs is to cadmium plate them.

In cleaning this class of work a 10-minute dip in a boiling solution of ammonium citrate or ammonium tartrate (16 oz/gal) is useful in removing superficial rust without hydrogen embrittlement of the steel.

Zinc plating of the springs is best done in a bath containing 8 oz/gal zinc cyanide, 4 oz/gal sodium cyanide, and 10–12 oz/gal caustic soda.

After these chemicals have been dissolved, add 0.1 oz/gal sodium sulfide in the form of a dilute solution. The bath is operated at 140° F with anodes of electrolytic zinc, alloyed with magnesium or aluminum. The cathode current density should be 10 asf during the first five minutes, then 20 asf until the desired thickness of zinc has been deposited. The solution should always be operated at 100 per cent cathode current efficiency to prevent hydrogen adsorption.—C. J. Wernlund.

A. My only concrete suggestion is to operate the zinc bath at as high an efficiency as is possible and still obtain satisfactory covering and throwing power, then bake the springs after plating to relieve the hydrogen embrittlement as much as possible.

A possible procedure is to apply a cadmium flash sufficiently thick to overcome the effect of the base metal and plate in a high efficiency cyanide zinc solution. Baking would also be desirable subsequent to this procedure.—R. B. Saltonstall.

A. During the war, we had occasion to zinc plate springs in a few special cases, and the only way that we could plate them with zinc without hydrogen embrittlement was to use the pyrophosphate zinc plating process. This solution is practically neutral and plates at relatively high efficiency. Both of these factors probably help eliminate hydrogen embrittlement. A few samples will soon tell what results can be obtained.—J. E. Starecк.

A. The acid zinc bath, of course, causes much less embrittlement than the cyanide zinc bath, but that isn't much help with coil springs.

It might be worthwhile to investigate the zincate bath developed in England during the war. I have always felt that cyanide baths are much more troublesome than most other baths.—K. G. Soderberg.

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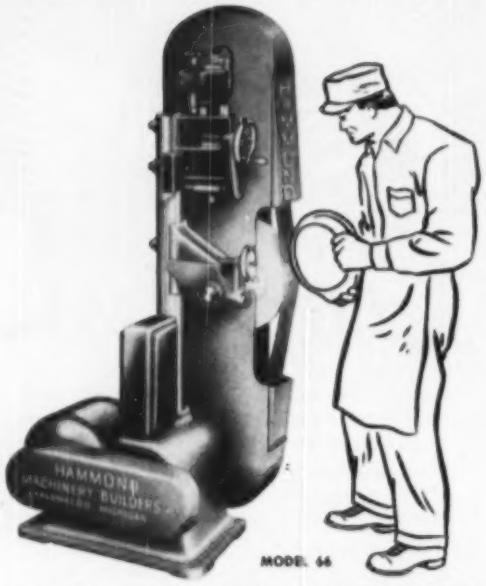

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Article Abstracts

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Electroplating Recessed Areas with Dipolar Electrodes. Vuvel C. Jones. Iron Age **162,** 98–99 (October 7, 1948). Parts requiring plating of recesses or deposition of an extra heavy plate on a specified area are a major problem. Describes use of dipolar electrodes, which use stray bath-currents and have no direct connection to either electrode.

Operational Formulas for Electrotinning Steel Strip. J. H. Mort. Iron Age **162,** 104–110 (December 2, 1948).

A review of operational formulas in electrolytic tinplate production and a summary of conclusions to be drawn from development and production work are given. Special slide rules and nomographs designed to speed or eliminate time-consuming calculations are described, and the methods by which calculation shortcuts can be designed for and applied to electrotinning line control are discussed. Two general procedures for mechanical manipulation of the tin strip in its passage through the electrolyte are discussed. In one the strip traverses a straight horizontal line through the electrolyte for plating on one side and then reverses direction to again follow a straight line through a second bath for tinning the opposite surface. The other system has the strip follow an undulatory course through a single bath for simultaneous coating of both sides. In acid lines, 4.8814 lb. of tin are deposited per 1000 amp-hr while only half that weight is precipitated in an alkaline bath with the same expenditure of current. Also, in acid baths electrical efficiency approaches 100 per cent while in alkaline solutions the efficiency falls lower. Furthermore, higher current densities can be used in acid baths.

Platings for Machine Parts. C. L. Faust and William H. Safranek. Machine Design 145–148 (November, 1948).

Factors in the selection of metal deposits are discussed and data presented on the thickness, physical properties, and stresses produced by plating from various baths. Types of commercial deposits now available are outlined and their applications discussed from the decorative and utility viewpoints.

Preparation of Aluminum for Painting. R. Mansell. Aero Digest 93, 96–118, 119 (October, 1948).

It has been found that surface roughening of smooth metal is not necessary to obtain adequate adhesion of the paint film. Sand blasting of the surface gives a better metal anchorage for the paint. Since sand blasting may introduce corrosion later on, it is advan-

tageous to follow it by an anodic coating before application of the paint film. An important factor which can cause loss of paint adhesion is the existence of a chemical reaction at the interface between the metal surface and the paint film. Means of stopping the reactions are discussed. Details are given of extensive tests conducted to evaluate various types of surface treatments used to prepare aluminum alloys for painting.

High-Temperature Ceramic Materials. A. L. Berger, AMC Tech. Data Digest **13**, 13–18 (December 1, 1948).

Ceramic coatings for high-temperature use were developed during the war, largely to conserve high-temperature strategic alloys—nickel, cobalt, tungsten, tin, columbium, and others. Development and application of ceramics has proceeded to aircraft power plants, and metal ceramic materials and cermets promise a wide range of uses. AMC requirements include materials for the interior of turbine engine tubes; for tailcones and tailpipes; for rocket combustion chamber liners and nozzles; for missile combustion chambers, guide vanes, reactors, and war heads; for application to supersonic air foils; and other vital application to jets, rockets, and guided missiles.

Electroforming Difficult Shapes. W. H. Prine. Prod. Eng. (December, 1948).

Possibilities in joining, forming dies, bonding abrasives, and making accurate shapes by electroforming are analyzed. Electroforming can well be referred to as a method of "cold casting". It is a process whereby a unit which cannot be produced economically by conventional methods is fabricated by electrodepositing a shell of copper, iron, nickel, or, occasionally, other metal upon a removable mandrel or pattern. During World War II, considerable work was carried out in the production of precisely dimensioned radar wave guides. Only through electroforming was it found practical to achieve the close internal dimensions and the smooth finish of the complex shapes involved. Some other typical applications of electroforming concern pitot static tubes, computer cams for fire direction, thin wall tubing, precision-mesh screens venturi meters, and reflectors.

How To Specify Surface Quality. J. F. Fischer. Machinery **55**, 174–177 (September, 1948).

Information is given on standardized classification and designation of surface qualities as taken from an ASA publication under the title "Surface Roughness, Waviness, and Lay" (Part I of ASA B46.1–1947). In this standard, a number of definitions of the geometrical irregularities of surfaces, such as roughness, waviness, flaws, and lay, are communicated, and it is explained how surface specifications should be correctly indicated in drawings. Some new symbols are likewise introduced. General use of the standard is expected

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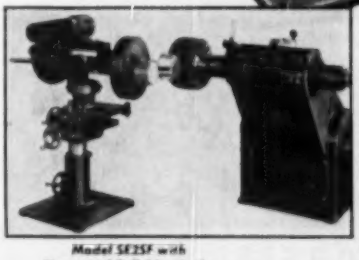

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to eliminate the confusion produced by the use of vague classifications such as "rough", "rough commercial", "reflecting", "high", "ultra", and "mirror" finishes.

How To Select Inorganic Finishes. W. R. Meyer, Steel **123**, 112–114, 142 (December 6, 1948).
A wide variety of inorganic finishes is available to the designer for finishing his products. Among these are electroplated finishes, hot dip coatings including tin, tin-lead, zinc and aluminum, oxide coatings, phosphate coatings, and "oxidized" finishes produced by sulfide solutions. Immersion metallic coatings deposited from aqueous solutions are also used to some extent. The selection of the coating depends upon what property or properties are desired for the particular job. Electroplated finishes may be applied for corrosion protection, wear resistance, beauty, solderability, low-electrical contact purposes, reflectivity, and many other purposes. Zinc and cadmium are deposited to give electrochemical and chemical corrosion resistance to steel articles; of these zinc is finding wider application than cadmium because of the very high price of the latter. The advantages of each are explained in detail. The various methods of producing oxide coatings for use on iron and steel, copper, and copper alloys, aluminum, and zinc are discussed, and their advantages in commercial use are explored.

Plastic Coatings and Corrosion. C. G. Munger, Corrosion **4**, 557–565 (November, 1948).
Four factors have been established which are essential to any plastic coating which is to withstand severe corrosive conditions: (1) the selection of a plastic which is basically resistant to corrosion; (2) the formulation of this basic material for maximum impenetrability both to the chemical involved and to moisture vapor; (3) high adhesion to the basis surface; (4) the application of the finished coating in a proper thickness and to a properly prepared surface. In the wide range of plastic materials from which coatings can be made, the most important group is the vinyl resins. They provide tough, elastomeric films, have a high resistance to acids, oxidizing conditions and age, a

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limited solvent solubility, excellent weather resistance, and limited adhesion. Other materials used are the styrene group of resins, chlorinated rubber, acrylic resins, the cellulose group of synthetic resins, the unmodified phenolic baking coating, the silicone-type resin, Teflon, and polyethylene. Moisture can cause the failure of any of these synthetic resin coatings by means of direct moisture-vapor transmission, by osmosis, or by electroendosmosis. Consequently, it is important that any corrosion-resistant coating be formulated as well for a minimum of moisture-vapor transmission. This can be accomplished by the use of hydrophobic pigments, highly water-resistant plasticizers, and the use of plate-type pigments. The third factor, adhesion, is obvious. The last factor is that of application and surface preparation. Sandblasting, pickling, flame treatment, chipping, and wire brushing are some of the methods used.

Corrosion of Metals. T. H. Rogers. Metal Industry **73**, 432–433 (November 26, 1948).
While any bacteria which are capable of forming a colony in close proximity to a metal surface may be responsible for corrosion of the metal, three specific groups of bacteria are known to produce effects which are sharply defined and well understood. Sulfate-reducing bacteria cause anaerobic corrosion of iron as well as of nonferrous metals by performing the action of a depolarizer in removing and oxidizing cathodic hydrogen. Sulfur-oxidizing bacteria, while of less importance than the former group, give rise to the evolution of sulfuric acid. Bacteria-producing carbon dioxide or ammonia as a result of their normal metabolism accelerate corrosion in both salt and fresh water. The most effective methods of combatting bacterial corrosion consist in the use of dyes where the system is not too large, or else in the application of corrosion resistant alloys.

How Glass Reflectors Are Made Through Vaporization of Aluminum. Kenneth Rose. Materials and Methods **28**, 85–87 (December, 1948).
After naming reasons for the selection of aluminum as a reflector material for internal applications, the author gives the step-by-step procedure for preparing the lamps and the methods used in the metallizing operation.

Existence of Microfissures in Deposits of Electrolytic Chromium; Their Influence on the Fatigue Strength of Steel Parts. P. Bastian and A. Popoff. Metaux & Corrosion **23**, 191–198 (September, 1948).
Photomicrographs show presence of a fan-shaped needle-like structure in electrodeposited chromium. This apparent structure is said actually to represent a series of small fissures. It seems that such fissures have a very unfavorable influence on the fatigue-bending strength of chromium-plated alloy steel containing 13 per cent chromium. Causes of this phenomenon are explained. Data are charted and tabulated. 27 ref.

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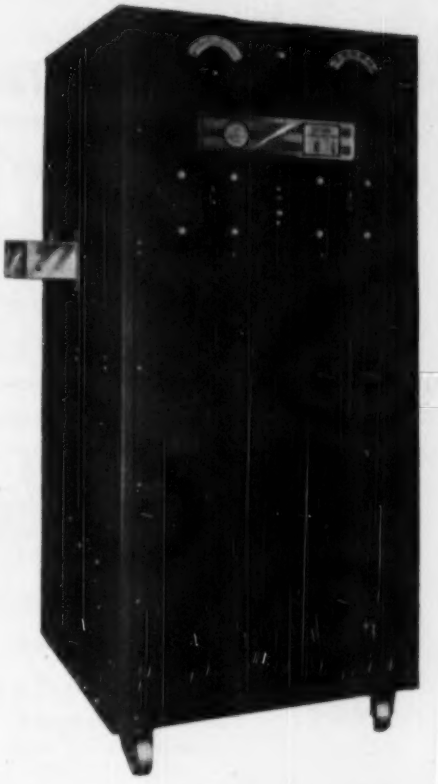

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Patent Abstracts

By GEORGE B. HOGABOOM
Consultant, New Britain, Conn.

Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.

No. 2,457,152, December 28, 1948—Electrodepositing Composition and Bath—R. A. Hoffman, assignor to E. I. du Pont de Nemours & Company.

This invention relates to the electrodeposition of tin and is more particularly directed to tin plating compositions, tin plating baths, and to processes for electrodeposition of tin in the presence of a bath-soluble polyether containing a multiplicity of ether groups attached to aliphatic carbon atoms.

Polyethers may be used according to the present invention in any tin plating bath.

10 bath compositions, 11 examples of substituents for polyakylene oxides, and 29 examples of solution composition are given.

CLAIM 1. In a process for the electrideposition of tin the step comprising effecting electrodeposition from an aqueous tin plating bath which contains a soluble tin compound, the process comprising effecting electrodeposition in the presence of 0.001 to 25 grams per liter of a bath soluble polyalkylene oxide of molecular weight over 400 as an addition agent.

23 claims.

References cited: U. S. Patents 2,134,427; 2,211,251; 2,213,477; 2,266,330; 2,271,209; 2,275,378; 2,366,737; 2,370,986; 2,391,289; 2,407,579. British Patents 346,550; 432,358; 443,429. Ind. Eng. Chem. 16–22 (January, 1941).

No. 2,457,234, December 28, 1948—Apparatus for Electrolytically Determining the Thickness of Metal Coatings—W. S. Herbert and H. T. Francis, assignors to Armour Institute of Technology.

This invention relates to a method of and to an apparatus for determining the thickness of metal coatings on foundations of dissimilar metals or alloys, or of a non-metallic character.

Previous methods that have been generally used for measuring the thickness of metallic coatings include the following:

1. Magnetic or electromagnetic method
2. Jet test or spot test
3. Dropping test and immersion test
4. Chemical or electrolytic stripping and weighing or analysis
5. Electrochemical stripping of a small area at constant current
6. Microscopic method
7. Chord method

The first three of the above methods do not give very accurate results. The first method is applicable only to certain combination of coatings and base metal (by which term is meant the foundation metal) and in many cases does not give very reliable result for thin coatings. The second and third methods are subject to many variables and require close temperature control for accurate results. The fourth method is applicable only to determining the average thickness for fairly large areas. It is less accurate when used for thinner coatings. The fifth method has been used for determining the thickness of chromium plating and is inherently quite accurate, but it has the disadvantage that the end-point is not so sharp as desirable and that the apparatus is neither portable nor simple to operate. The microscopic method requires expensive equipment and a skilled operator and also is not applicable to coatings of soft metal. The chord method is not very accurate and can be applied to flat surfaces only with difficulty.

We have found that the thickness of metal coatings can be rapidly and accurately determined by making a small area of the coating the anode in an electrolytic or voltaic cell and then discharging the cell at constant current until the metal coating is completely removed.

It is a further important object of this invention to provide a device for use in determining the thickness of metal coatings that is readily portable and that requires no outside source of current.

By way of example, the thickness of a thin tin electroplate on steel may be determined in about two minutes with an accuracy of 2 per cent.

CLAIM 1. Apparatus for use in determining the thickness of a metal coating over a dissimilar foundation metal, comprising an open-ended hollow metal member for direct gravity contact with the coating to be measured, said member having an upper inturned annular shoulder, annular insulating and sealing means movable within said member for resting against said coating to define a predetermined area thereof, resilient means between said shoulder and said annular insulating and sealing means transmitting a part only of the weight of said metal member to urge said insulating and sealing means against said coating, a hollow electrode extending into said metal member and fitted into said annular insulating and sealing means to form the side walls of a receptacle for an electrolyte, and external electrical connections to said electrode as the cathode and said member as the anode to complete an electrical circuit including said electrode, metal member and said electrolyte to effect an anodic dissolution of metal from said coating over said predetermined area.

2 claims, 3 figures.

References cited: U. S. Patents 1,739,657; 1,725,877; 1,771,680; 2,135,873; 2,206,026; 2,319,196. British Patent 483,503. J. Appl. Phys. 726, 727 (October, 1939). Metallurgia 101, 102 (December, 1943). "Electrochemistry", W. A. Koehler, 2nd ed., 1944, p. 58.

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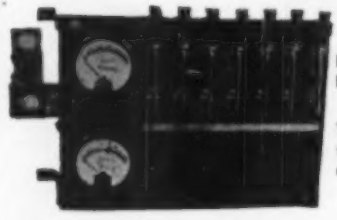

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No. 2,457,510, December 28, 1948—Electroplating Apparatus—D. G. Van Ornum.

The present invention relates to new and useful improvements in electroplating apparatus and more particularly to a machine for accurately building up to exact dimensions various types of metal surfaces, such as shafts, internal or external cylinder walls, or flat surfaces, by means of an electrode mounted for movement over the work and maintained in slightly spaced relation from the work while an electroplating solution bridges the space between the work and the electrode.

CLAIM 2. An electroplating device comprising a housing of non-conductive material and adapted to be moved in a fixed path over a piece of work to be electroplated, an electrode projecting out of said housing to travel therewith with one end in close proximity to the work, said electrode being slidably mounted in said housing for retraction therein, work-engaging means of insulation material secured to and extending beyond said electrode for causing retraction of the electrode into said housing as the thickness of the electroplating on the work increases, a switch carried by said housing for controlling an electric circuit in which the electrode is interposed, means for opening said switch operative by retraction of said electrode in a predetermined degree, a terminal on said housing adapted to be interposed in said circuit, and spring means for opposing retraction of said electrode and forming an electrical conductor between said electrode and terminal.

4 claims, 7 figures.

References cited: U. S. Patents 1,805,215; 1,856,409. British Patent 18,643.

Re-issues 23,068-9, January 4, 1949 (original Nos. 2,442,591-2, June 1, 1948)—Electrolytic Polishing of Stainless Steel—Alexander L. Feild, assignor to Armco Steel Corporation.

CLAIM 1 of Re. 23,068. In the polishing of a stainless steel product, the art which comprises immersing the product to be polished in a bath containing by volume 80 to 40 per cent of concentrated nitric acid and the remainder concentrated acetic acid, and while maintaining the bath at a temperature below 25° C passing only alternating current through said bath between the product and a cooperating electrode immersed therein, the current density being at least ½ ampere per square inch of the product surface.

CLAIM 2 . . . at a temperature of —12° C to +15° C . . .

CLAIM 3 . . . at a current density of ½ to 12 amperes per square inch . . .

CLAIM 1 of Re. 23069 . . . a bath containing by volume 80 per cent or more concentrated aqueous nitric acid (sp. gr. 1.40–1.42) and the remainder water . . . the (ac) current density being at least ½ ampere per square inch of product surface.

CLAIM 2 . . . while maintaining the bath at a temperature of —12° to +15° C.

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CLAIM 3 . . . the (ac) current density being at least ½ to 12 amperes per square inch.

5 claims, 1 figure in each patent.

References cited in Re. 23,068: U. S. Patents 1,772,541; 1,787,672; 2,040,618. British Patent 485,089; 521,290. French Patent 707,526. Italian Patent 372,802. Metal Progress 755–756 (December, 1939). "Monsanto Chemicals", 26th Ed. 1942, pp. 21 and 81. Re. 23,069: U. S. Patents 2,040,618; 2,424,674. British Patent 530,041.

No. 2,458,525, January 11, 1949—Method and Apparatus for Brightening Tin Plate—J. S. Nachtman.

CLAIM 4. The method of continuously brightening steel strip electroplated with tin includes the steps of preheating the strip by passing the strip through a first body of liquid hydrocarbon heat-conducting medium maintained at a temperature sufficient to preheat the tin to about 440° F, then raising the temperature of the tin to about 460° F while passing the strip through a zone containing a second body of liquid hydrocarbon medium, then quenching the strip by passing the strip through a third body of liquid hydrocarbon medium, and introducing the strip on its way to the first preheating body of medium through said third quenching body of liquid hydrocarbon medium in heat exchange relation therethrough with the quenched strip to the incoming strip through the liquid hydrocarbon, whereby the quenched strip emerges from the third body at about 310° F and the incoming strip is heated to a temperature of about 300° F in said third body.

LEGEND. The oil bath used as a liquid medium in compartments A, B and C in each of the forms of the invention is preferably, as stated, a bath of a high boiling petroleum fraction having a final boiling point range between the approximate limits of 450° F and 850° F. A typical petroleum fraction having a boiling range within the range referred to is a material sold under the trade name of "Mentor 28" which has a boiling point range of 505° F to 650° F, a flash point of approximately 255° F, and a fire point of approximately 294° F. This material has a viscosity of 4.83 centipoises at 25° C, has practically no vapor pressure or evaporation loss at 25° C and a gravity range between 35° to 38° A. P. I. Another typical petroleum fraction is a material sold under the trade name of "Mineral Seal Oil VM-1103" . . .

11 claims, 6 figures.

No. 2,458,676, January 11, 1949—Apparatus for Electroplating—Abner Brenner and Thelma S. Meites, assignors to the U. S. of A. as represented by the Secretary of Commerce.

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on each ball as well as a uniform thickness of plating on each of a plurality of balls simultaneously receiving an electroplating of chromium.

CLAIM 2. A portable electroplating rack adapted to be suspended in suitable baths, comprising conducting means for supplying electroplating current, a ring-shaped cathode, an electrically conductive cathode-supporting spider, a conductive post rigidly connected to said spider, an annular ball-confining guide concentric with and of greater diameter than said cathode also supported by said spider, a second concentric guide in the plane of said first guide and of lesser diameter than said cathode and also supported by said spider, a sleeve rotatively mounted on said post, a second spider rigidly connected to said sleeve, a friction ring carried by said second spider of a width and diameter corresponding with those of said cathode ring, resilient means pressing said friction ring toward said cathode and power-driven means for rotating said friction ring with respect to said cathode, said device being adapted to receive a plurality of metal balls between said cathode and said friction ring and to confine such balls between said ring-shaped guides while immersed in said baths.

3 claims, 3 figures.

References cited: U. S. Patents 491,666; 1,154,604; 1,336,052; 1,916,492; 2,007,204; 2,397,177. British Patent 323,947.

No. 2,458,827, January 11, 1949—Electrodeposition of Lead-Tin-Antimony Alloys—J. M. Booe, assignor to P. R. Mallory & Company, Inc.

The present invention contemplates the formation and application of a lead-tin-antimony alloy by means of electrodeposition . . . Attempts to electrodeposit ternary alloys have been hindered by such defects as lack of control over the composition of the plate, poor corrosion of anodes, deposition of one of the metals upon the anode in the form of a sludge, the oxidation of one of the metals to form a precipitate in the bath, and the crystallization of the alloy deposit on the cathode.

The electrodeposition of lead-tin-antimony alloys is preferably conducted using a binary anode containing about 3.5 per cent tin and balance lead, while the electroplating bath contains lead fluoborate, fluoboric acid, and antimony trioxide or antimony fluoborate making a bath of the following composition:

	Range	*Preference*
Tin	0.5– 10 g/l	3 g/l
Lead	5–200 g/l	75 g/l
Antimony	0.1 g/l	saturated
Free boric acid	1– 40 g/l	25 g/l

Sufficient fluoboric acid to make the *p*H less than 3 (colorimetric) and preferably less than 0.5
Beta naphthol, about 1 g/l which is approximately equivalent to saturation.

CLAIM 1. The method of electrodepositing lead-tin-

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2—1000/500 AMPERE, 6/12 VOLT, **CHARLES J. BOGUE ELECTRIC CO.**, Separately Excited, Interpole Design.
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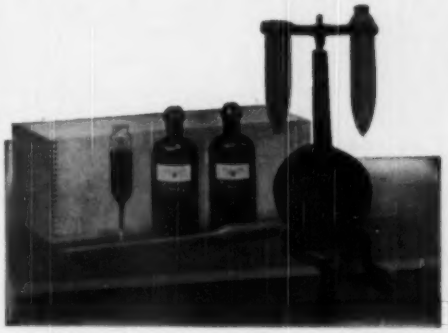
for determining
Sulfates in Chromium Solutions



This apparatus enables anyone to accurately and quickly determine the sulfate content of a chromium plating solution.

For consistently good plating results, the ratio of sulfates to chromic acid must be maintained within very definite limits so that a constant check must be kept.

This is easily accomplished with this equipment and we can also supply sets for quickly ascertaining the chromic acid and trivalent chromium content.

We also manufacture test sets for analyzing other plating solutions, cleansers, pickles, anodizing baths, for determining the thickness of zinc, cadmium, copper and tin deposits and for pH determination.

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- Chrome Dyes
- Sodium Bichromates
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- Metal Dust
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- Plastic Compounds
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This latest model backstand is heavily constructed with machine tool accuracy. Reversible for right or left hand installation . . . Remote control belt tracking device . . . Constant and adjustable belt tension . . . 12″ cast aluminum idler pulley equipped with roller bearings, assures quiet vibrationless operation. Belt changing is accomplished in a matter of seconds.

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antimony alloys which comprises passing current between a cathode and an anode consisting of a minor portion of tin and a major portion of lead through an electrolyte consisting essentially of lead fluoborate, tin fluoborate and a compound selected from the group consisting of antimony trioxide and antimony fluoborate, maintaining a tin concentration of 0.5 to 10 grams per liter and a lead concentration of 5 to 200 grams per liter by corrosion of the anode, and maintaining an antimony concentration of 0.1 gram per liter to saturation by periodic addition of a soluble compound to the bath, said compound being selected from the group consisting of antimony trioxide and antimony fluoborate.

CLAIM 5. A process in accordance with Claim 1 in which the anode is covered with a layer of paper and a layer of gauze is placed over the paper to hold the latter in place upon the anode.

References cited: U. S. Patents 1,364,051; 1,452,573; 1,842,028. French Patent 629,470. Australian Patent 119,617. Metal Industry 264–266 (June, 1920); 469-471 (April, 1936).

No. 2,459,129, January 11, 1949—Production of Photographic Stencils—D. G. Gresham and E. E. Loening (England), assignors to Eastman Kodak Company.

CLAIM 1. The method of producing a stencil in an element comprising a support, a first phenolformaldehyde layer carried thereby, and a second light-sensitive bichromated glue layer superimposed thereon comprising the light printing of an image in the second layer and the transformation of said light image to a hardened relief image, characterized by the treatment of said element after formation of said relief image with an etching bath of 90 per cent lactic acid and 10 per cent ethyl acetate that etches any unhardened portions of the outermost layer and also the portions of the first layer exposed through said relief image.

CLAIM 2. The method of making an electrical resistance consisting of a fine metallic grid that comprises printing an image of fine lines upon an element comprising a nickel-plated copper support and two superimposed layers thereon, the inner layer being phenolformaldehyde resin composition and the outer layer being light-sensitive bichromated glue, transforming the image in the outer layer into a hardened relief image by treating the element with a bath of 90 per cent lactic acid and 10 per cent ethyl acetate that attacks any unhardened portions of the outer layer and the portions of the inner layer thus exposed, electrodepositing copper in the spaces thus formed, thus forming a fine copper grid, and stripping the grid from the support.

2 claims, 5 figures.

References cited: 967,875; 992,898; 1,430,347; 1,802,-936; 1,922,434; 2,080,965; 2,123,297; 2,166,366; 2,215,-128; 2,225,733; 2,257,143; 2,279,567; 2,361,665, British Patents 183,817; 545,942. Austrian Patent 52,200.

PARAMOUNT BRAND
FELT WHEELS
TOPS IN Versatility
There's a Paramount Brand Felt Wheel to meet your polishing requirements. Here are a few of the more important applications: as a grease set-up wheel, as an oil wheel, as a dry wheel, as a greaseless wheel, as a buffing wheel, as a lapping wheel, and as a contact wheel for belt polishing.
. . . And Paramount Brand Felt Wheels are better because they hold desired edges and shape throughout wheel life, because they have several times the life of built up wheels, because they have uniform density which provides greater head life and because they provide a particularly fine surface for bright plating.
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LOW COST • TARNISH RESISTANT
LUSTROUS FINISH!
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At amazing low cost SPEKWITE produces the richness and beauty of a tarnish resistant precious metal finish. Successfully operated in large and small plating plants and for industrial application on mass production.
NO SPECIAL EQUIPMENT IS REQUIRED
SPEKWITE plates directly on hard metals; nickel, german silver, bronze, copper, gold, silver, iron and steel and most solders; has high throwing power for penetrating deep recesses and basket plating. Articles can be formed after plating without cracking or peeling.
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Because it *economically* gives lasting, chrome-like brightness to zinc or cadmium plate, Iridite Bright is the final finish on hardware for The Cleveland Welding Company's famous Roadmaster Bicycle.

Shop-wise, Iridite Bright offers many advantages: a simple chemical dip, ease and speed of operation, non-electrolytic, requires only usual plating shop equipment and operators. And you get uniform consistent results from manual or automatic processing operation.

A few of the many applications for Iridite Bright include wire products, such as baskets and refrigerator shelves, electrical parts, such as radio chassis and speaker frames, and many other zinc or cadmium-plated parts or assemblies.

Other Iridites provide amazing corrosion resistant finishes and excellent paint adherence for all zinc and cadmium surfaces—die-cast, galvanized or plated.

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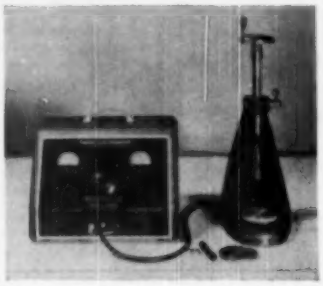
386 INDICATE A 280.

Equipment and Supplies

E—247. Electrograph Used for Pin Hole Detection—Fisher Scientific Company, 717 Forbes Street, Pittsburgh 19, Pa., and Eimer & Amend, Greenwich and Morton Streets, New York 14, N. Y., have announced the new Fisher Electrograph, a pioneering instrument with many potential applications in qualitative and quantitative analysis of metals and metallic alloys.



The instrument transfers electricaliy a few micrograms of the sample onto previously prepared bibulous paper or a gelatin surface. Standard qualitative spot tests then indicate presence of elements. The color intensity of reaction on test paper varies both with time of "exposure" and with concentration of element in sample. Thus, employing samples of known concentration to plot a curve and following uniform procedure, quantitative measurements can be made.

Uses investigated include detection of pinholes in electroplated metals. For further information, use Reader Service Card.

E—248. Stainless-Steel Degreasers—Circo Products Company, 12119 Berea Road, Cleveland 11, Ohio, has announced a new line of completely automatic, push-button controlled vapor degreasers, on which all surfaces exposed to solvent vapors are protected by stainless steel. These degreasers also feature (1) built-in reservoir tank for solvent flushing and for automatically restoring solvent to proper operating level in tank, as well as conserving valuable shop space, (2) large, readily removable, leak-proof clean-out door which makes cleaning of tank easier and quicker, (3) elimination of moving parts to assure trouble-free operation at lowest possible maintenance costs, (4) push-button controls with indicating lights which, with a temperature gauge, constantly show operating condition of the degreaser, thus assuring continually economical performance, and (5) 20 per cent increase in work capacity and speed of efficient and thorough cleaning of metal parts. For further information, use Reader Service Card.

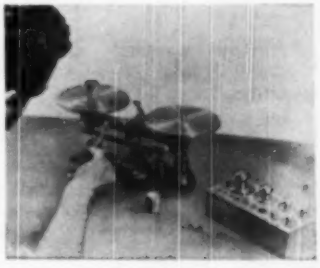
E—249. Tight Cast-Iron Pipe Plugs—Due to the excessive amount of trouble experienced with leaking pipe threads on plugs used in automotive and other industries, an improved standard of pipe threads known as the Dryseal has been established by the cooperation of the industries involved. This thread is designed to eliminate leakage and to do so without the use of sealer compounds or dope of any kind. The seal is accomplished by metal-to-metal contact which is produced by a truncation of the major diameter (root) of the internal thread and a truncation of the minor diameter (root) of the external thread.

The Dryseal threaded pipe plugs are entirely interchangeable with the present standard Briggs type pipe thread. Plugs machined for Dryseal can be used in regular female threads with considerable increased efficiency.

U. S. Plug & Fitting Company, Canton, Ohio, manufacturers of cast iron, brass and aluminum pipe plugs, thread all of their pipe plugs Dryseal at no extra cost.

E—250. Stainless-Steel Trip Balance—The Ohaus Scale Corporation, 10-14 Hobson Street, Newark 8, N. J., announces its new Harvard Trip Balance, featuring stainless steel weighing platforms and beams. This equipment is now available through scientific supply dealers from coast to coast.

The Ohaus Harvard Trip Balance (even arm scale for comparative weighings) is equipped with 6-inch diameter stainless-steel plates at points of continuous usage. Heat, chemicals, or accidental sharp blows are said not to affect the stainless-steel weighing platforms or the stainless-steel



relief etched beams that give clear, accurate readings.

Ohaus patented bearing construction, employing self-aligning, polished agate bearings against precision hollow-ground tool-steel knife edges, insures the maximum sensitivity attainable with this type of balance. The rigid cast-iron beam is capable of withstanding heavy overloading without danger of deflection. All bearing parts are properly hardened and all vital components are heavily plated.

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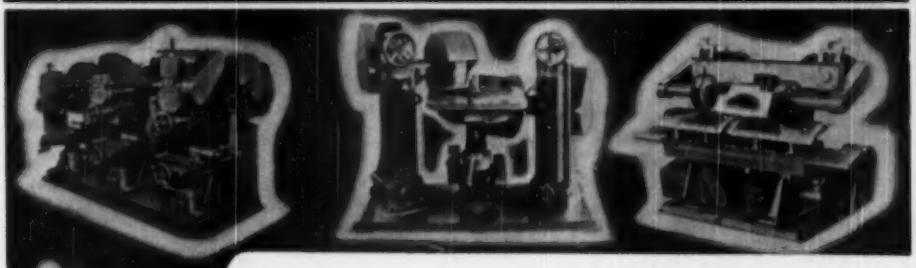
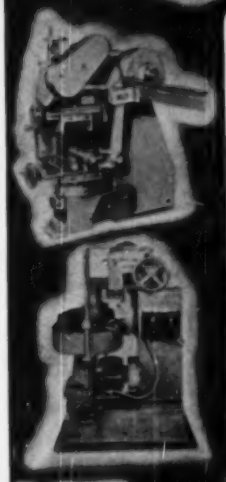
• FOR HIGH PRODUCTION POLISHING AND BUFFING •

ACME "Specials"





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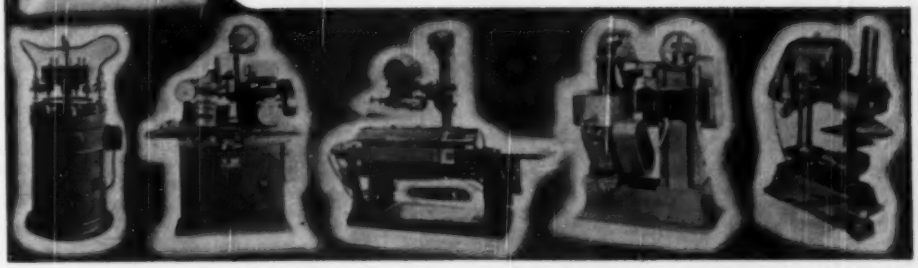
In addition to Straight Line, Rotary and Semi-Automatic Polishing and Buffing machines, ACME builds special machines to handle unusual or odd shaped parts that cannot be effectively put on a production basis with other machines.

ACME "Specials" not only make it possible to finish parts that would be difficult, hazardous or impossible to handle manually, but also produce a uniform quality finish at low cost.

Among the unusual parts that are handled by ACME specials are square, hexagonal, round and oval tubing; automotive reveal mouldings and mirror frames; plumbing goods, automotive and builders' hardware, electrical goods, gears and plastic items.

Grinding, polishing, buffing, burring, wire brushing, and abrasive belt finishing operations are handled at high production and low unit costs on ACME "Specials"—where parts are of a nature not suitable for handling on ACME Rotary, Straightline or Semi-Automatic machines.



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WHICH TWIN HAS THE LUSTER-ON.?

Shown here are two untouched photographs of a Stanley Home Product. One has been zinc plated and Luster-on dipped. The other has been cadmium plated. **CAN YOU TELL WHICH IS WHICH?***

These comparative photographs *prove* conclusively that Luster-on on zinc is equal in looks to cadmium. A long list of successful users proves that Luster-on is *superior* to cadmium when you check out final results and costs.

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at half the cost

If you're using hard-to-get, overpriced cadmium, you'll be interested in this superior finish . . . *LUSTER-ON on zinc!* Better than cadmium for most uses, Luster-on costs about half as much to use and is always available. A simple Luster-on dip at the end of your zinc plating line gives your product a finish that's permanently chrome-bright, rust and corrosion proofed – that resists handling smudges and age stains.

Write for the Luster-on booklet that gives you full information and includes a cost analysis of Luster-on on zinc vs. cadmium. It's yours for the asking, at no obligation.

SEND COUPON TODAY 91

**The one at the right is Luster-on dipped.*

The Chemical

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Send me the Luster-on booklet and cost analysis.

Name .....

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I am [ ] am not [ ] sending you a sample for free Luster-on dip.

Equipment and Supplies

E—251. Coated Fabric Gloves—Development of a new coated-fabric work glove that is said to outdo rubber and all standard synthetic-coated gloves in resistance to both chemicals and abrasion, is announced by the Surety Rubber Company, Carrollton, Ohio. The new gloves will sell for the same price as standard oil-resisting synthetic-coated gloves.

The difference between Surety's new glove and coated-fabric gloves now on the market lies in the coating, Sureseal PK, which is an adaptation of Surety's Sureseal synthetic rubber.

The new glove is available in knit wrist, band-top, and 12- and 14-inch gauntlet types. All types are jumbo size, with curved fingers. For further information, use Reader Service Card.

E—252. Water-Soluble Tripoli Composition—Although for years the plating industry has heard reports of water-soluble Tripoli compositions, no such composition is said to have had really good working properties in addition to its solubility characteristics. The Hanson-Van Winkle-Munning Company, Matawan, N. J., has now developed two compositions, 2-S-10 and 2-S-12, that are as water-dispersible as any and at the same time claimed to have superior working properties. In fairness to users, it is pointed out that while the performance characteristics of the new compositions are good, the cutting properties and composition-and-buff "milenge" do not quite measure up to the best in the standard Hanson-Van Winkle-Munning group. They will be useful on work where the composition tends to pack and thus gives rise to a cleaning problem and where the performance is good enough and the main attraction is ease of cleaning.

Composition 2-S-10 is recommended for the heavier-duty jobs where more cut is required and maximum solubility is not the primary prerequisite. It is as soluble in water as any. Composition 2-S-12 is very dry and should be used on filigreed work and the like where cleaning is a real problem and heavy cut not so essential. It is said to be more soluble than any similar materials. Both compositions are

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6/12 Volts

1—8000/4000 Ampere, H-V-W Synch. M. D. 300 RPM
1—5000/2500 Ampere, B. & O'C. with Chandeysson synch. motor, 450 RPM
1—2000/1000 Ampere, H-V-W, 690 RPM
1—1250/625 Ampere, H-V-W, 850 RPM
1—1000/500 Ampere, Chandeysson, 690 RPM
1—1000/500 Ampere, Columbia, 1150 RPM
1—1000/500 Ampere, H-V-W, 1150 RPM
8—125 Ampere Hobart, 6 volts

12/24 Volts

1—1000/500 Ampere, H-V-W synch. M. D. 900 RPM
1—3000/1500 Ampere, Chandeysson Synch. M. D. 400 RPM

40 Volts

2—500 Ampere, Chandeysson Synchronous, 25 degree 900 RPM
2—1000 Ampere, Chandeysson Synchronous, 25 degree 450 RPM

10 V. to 60 V. Single Commutator

1—200Ampere, 11/15 V. Gen. Elec.
1—180Ampere, 14/18 V. Gen. Elec.
1—200Ampere, 15 V. Master
1—1000 Ampere, 15 V. Gen. Elec.
1—300 Ampere, 15 V. Star
1—800 Ampere, 22/33 V. Gen. Elec.
3—1500 Ampere, 20 V. Elec. Prods.
1—67 Ampere, 24 V. West.
1—600 Ampere, 24 V. Reliance
1—200 Ampere, 25 V. Star
1—1000 Ampere, 25/35 V. Diehl
1—300 Ampere, 25 V. Star
1—175 Ampere, 25 V. Cr. Wh.
1—500 Ampere, 32 V. Columbia
2—100 Ampere, 30 V. Gen. Elec.
1—200 Ampere, 30 V. West.
2—200 Ampere, 32 V. Gen. Elec.
2—1500 Ampere, 32/40 V. Elec. Prods.
1—1000 Ampere, 33 V. Gen. Elec.
2—200 Ampere, 42 V. Gen. Elec.
3—1500 Ampere, 45 V. Century
1—1500 Ampere, 50 V. Gen. Elec.
2—800 Ampere, 50 V. Gen. Elec.
1—400 Ampere, 50 V. Gen. Elec.
6—1500 Ampere, 50 V. Elec. Prods.
1—1000 Ampere, 60 V. Gen. Elec.

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firm and unlikely to crumble. For further information, use Reader Service Card.

E—253. Hoist Scale—A new weighing unit manufactured by Hydroway Scales, Inc., 7632 Fenkell, Detroit 21, Mich., automatically scales the load as it is lifted. It is said to eliminate much conveying in conjunction with weighing in shipping, receiving, and manufacturing departments and may also be used for checking weights for inventory. First applications are made for cranes and chain hoists, two-, five-, and ten-ton models being standard. Since the static pressure principle is used, the trade name of the scale will be "Hydroscale". It is permanently sealed, without moving parts, is unaffected by temperature, and in independent laboratory tests has been proven accurate within ½ per cent. For further information, use Reader Service Card.

E—254. Centrifugal Dryer—The Hanson-Van Winkle-Munning Company, Matawan, N. J., announces that two improvements have been made in its Mercil Type centrifugal dryer. Instead of a bevel pinion on a high speed shaft with a set screw, a longer shaft is now provided with threaded ends with SKF lock nuts and washers to eliminate the chances of binding gears. A flange is now provided over the rim of the dryer to prevent work from falling between the basket and the outer shell. For further information, use Reader Service Card.

E—255. Bright Dip for Aluminum—Chemlustre, a new process for aluminum, has been developed by Chemclean Products Corporation, 64 Sixth Avenue, New York 13, N. Y. It is recommended as a substitute for mechanical polishing for the following purposes: (1) to give badly weathered aluminum a uniform and bright appearance, (2) to bring aluminum articles to a highly lustrous semi-satin finish, and (3) in many applications where aluminum is to be anodized. Its use is said to make it possible to produce a variety of work which was formerly impracticable because of excessive costs.

The material used in the process is a 2-4 lb/gal alkaline solution of a white crystalline substance. It is used in ordinary steel equipment, preferably with an exhaust system similar to that used in chromium plating. The work to be Lustreized is immersed for ¼ to 2 minutes in the Chemlustre solution kept at 160 to 180° F, then rinsed immediately in cold running water. Smut is removed in either Chemclean No. 540 or 50-50 nitric acid at room temperature. The lustre will

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Physical Properties of Nickel Deposits; Measurement of Stress in Deposits and Its Effect on Thickness Determination; Judging the Quality of Plated Parts; Measurement of Porosity of Deposits; Oxidation of Trivalent Chromium in Chromium Plating Baths; Bright Barrel Plating of Nickel and Zinc; High-Speed "Bronze" Plating; Plating on Plastics; Strip Plating Evaluation; Electroplaters' Metals of the Future; Copper Plating without Roughness; Simple Test for Surface Cleanliness; Electropolishing; Engineering Planning in the Plating Department; Cost Finding and Estimating; Phosphatization of Steel; Conveyorized Spray Finishing.

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Equipment and Supplies

depend upon the alloy and the time of immersion.

E—256. Aluminum Finish—Special Chemicals Corporation, 30 Irving Place, New York, N. Y., announces a new coating called Spekaluminite that is said to be adherent to all metals and plastics, have high tarnish resistance, be low in cost, and require no other equipment than a baking oven. Other claimed advantages are air-drying in five minutes, resistance of 200 hours for one spray coat on cold-rolled steel, lustre and sheen of bright cadmium, temperature resistance of over 700° F, and absence of appreciable change in color, flexibility, or durability at a temperature of 1000° F. For further information, use Reader Service Card.

E—257. Small Filter Unit—Sethco, 105-107 150th Street, Jamaica 4, N. Y., announces another small filter unit, Model SSI, similar to Model SSU but equipped with a totally enclosed ball-bearing induction motor to prevent corrosion of motor components where accidental spilling of solution is likely to occur. The ball-bearing feature results in smooth operation and longer life, and no oiling is required.

Like Model SSU, Model SSI is designed for either periodic or continuous filtration and is constructed of stainless steel throughout. Suited for filtering all the common plating baths, these filter units are said to be simple and economical to operate. Only 3 minutes are required to set them up and many thousands of gallons of solution with average impurities can be filtered through each filter tube before it needs changing. These units have definite advantages for filtering expensive solutions such as silver, gold, rhodium, since all the solution contained in the unit is completely recoverable. No filter aid is said to be necessary, no messy powdered charcoal, no slurry tank, and no waiting for clear effluents.

Since the units weigh only 30 to 40 pounds (depending on the model), they are easily portable. For further information, use Reader Service Card.

E—258. Variable-Speed Burnishing Barrels—Increased efficiency in burnishing widely varying parts is said to be provided by an improved series of variable-speed burnishing barrels manufactured by Belke Manufacturing Company, 947 N. Cicero Avenue, Chicago 51, Ill.

The variable speed drive is mounted on top of the barrel where it is conveniently accessible for speed adjustment, yet stays dry and is out of the way. Critical adjustment to any rotating speed from 13 to 39 rpm is made by turning the small hand crank. Other speed ranges based on a 1-to-3 or 1-to-4 ratio can be furnished if specified. The barrels are said to be accurately balanced for easy tilting. A spring-pressure ratchet lock, operated by a foot lever, holds the barrel securely at any angle. Patented bearing construction provides smooth running with capacity or smaller loads. The aluminum cover is lightweight and self-sealing.

Available in three sizes, the barrel can be furnished with either hard maple or rubber lining, or with steel ribs welded to the inside surfaces. For further information, use Reader Service Card.

E—259. Portable Belt Grinder—A new machine manufactured by Delta Manufacturing Division, 600 E. Vienna Avenue, Milwaukee 1, Wis., is supplied in four different models. It is adaptable for use of two different quality belts at the same time to speed the production of small parts that require more than one finishing operation. In addition, the machine easily can be converted into a buffing machine. Aluminum-oxide coated belts in four different grits are available from the manufacturer for use on steel, brass, forgings, die castings, and some plastic materials. Silicon-carbide coated belts are recommended for hard materials of low tensile strength, though manufacturer urges consultation with an abrasives expert in all special cases. For further information, use Reader Service Card.

E—260. Strippable Protective Coating—Chemclean Products Corporation, 64 Sixth Avenue, New York 13, N. Y., has developed a new strippable protec-

AD No. 1

Highest stabilized degreasing solvent

—Stabilized NOT Alkalized

Years of research and development have produced this outstanding new BLACOSOLV. This new product has been subjected to the most rigorous stability tests for the most difficult jobs. Contains no alkaline materials which neutralize acid *after* breakdown. The new stabilizers *prevent* solvent breakdown and possible acid formation.

The new BLACOSOLV will degrease scientifically all metals or combinations of metals. You need not pay premium prices for special solvents for different metals. Blacosolv can be used over and over without impairing its high qualities.

G. S. BLAKESLEE & CO.

G. S. BLAKESLEE CO., CHICAGO 50 ILLINOIS
NEW YORK, N. Y. TORONTO, ONT.

BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

tive coating called Chem-Peel, a plastic emulsion that can be applied either by spraying or dipping to form a film of plastic which can easily be removed by peeling. It is said to be useful in dry spray booths where it acts as a barrier coating between the booth walls and the accumulated overspray which can easily be removed by simply pulling off the coating in one continuous sheet; and for protecting plated or finished parts against scratching, corrosion, finger markings, dirt, etc., in stamping of forming operations, during shipping, etc.

Chem-Peel is said to have the advantage of being relatively non-toxic, non-inflammable, and approximately 40 per cent less expensive than materials now generally sold for this purpose. For further information, use Reader Service Card.

E—261. Drying Equipment—A new mechanical dryer for spotless drying of metal parts has been announced by Optimus Equipment Company, 253 Water Street, Matawan, N. J.

The Optimus "Spotless" Dryer was originally designed for drying of highly

polished metal surfaces without water spots, stains or streaking. Since then, it has been adopted for all types of drying of metal parts handled on monorail systems, after plating or polishing and before subsequent plating or lacquering.

High-velocity jet nozzles specially designed and located reduce drying time to a minimum. These nozzles are directional and adjustable. Combination of cold and hot air is employed: the cold blast removes water by mechanical action, leaving a film which is removed by the following hot air blast. Provisions are made to recirculate all possible heated air. To reduce floor space, fans, heating units and motors are all located within the framework. Where overhead space permits, these units may be suspended from the ceiling. All auxiliaries are easily accessible for periodic inspection and maintenance. Air for drying can be heated by steam, gas or electricity. For further information, use Reader Service Card.

E—262. Bright Dip for Copper, Brass, Bronz—Iridite Metcote, a chromate-type dip for producing a lustrous, corrosion-resistant surface on copper, brass or bronze surfaces has been introduced by Allied Research Products, Inc., 4004 E. Monument Street, Baltimore 5, Md. Applicable to sheet, rod, castings, or forgings, Iridite Metcote is said to serve to brighten, provide tarnish resistance, or act as a base for paint.

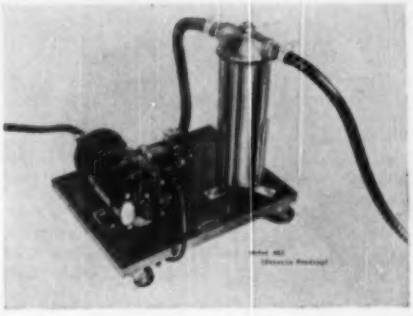
Run at slightly elevated temperatures, the solution is non-fuming and non-critical during operation; the work does not become etched, even from long immersion periods. Production rates may be increased by raising the temperature of the bath.

After thorough cleaning in standard solutions and thorough rinsing, the parts are treated in Iridite Metcote, rinsed, optionally treated in a bleaching dip, rinsed, hot-rinsed, and dried. For further information, use Reader Service Card.

E—263. Plating Rack Coating—The Hanson-Van Winkle-Munning Company, Matawan, N. J., announces the development of Kote-Rax Grade K, a plastisol rack-coating material designed to insulate and protect plating racks and fixtures in all types of electroplating and anodizing solutions. It is said to have excellent chemical resistance and be free from any tendency to introduce organic impurities into bright plating solutions.

The application is rapid and simple. Only two dips are required to obtain a final coating which is equivalent to ten or more dips of solvent-dispersed vinyl materials. For further information, use Reader Service Card.

LOW PRICED FILTERS—FOR SMALLER PLANTS



FILTERS: All the common plating solutions: acid, bright nickel, cyanide, etc.

EASY TO OPERATE and simple to clean.

NO LOSS OF EXPENSIVE SOLUTIONS: Unit holds only a small volume of liquid, all of which is recoverable.

ECONOMICAL OPERATION: Many thousands of gallons can be filtered with each tube.

PORTABLE: Can be wheeled, pushed or carried.

CONSTRUCTION: Stainless steel type 316 throughout; ball bearing, completely enclosed motor.

Write for descriptive literature
(other models available)

Sethco • 105-07 150th ST., JAMAICA 4, N. Y.

Trade Literature

L—186. Floor Maintenance Materials—Stonhard Company, Dept. P, 1306 Spring Garden Street, Philadelphia 23, Pa., offers a 6-page illustrated folder describing applications of the company's maintenance and repair materials for floors, walls and roofs. For your copy, use Reader Service Card.

L—187. Illuminated Magnifier—Henry A. Gardner Laboratory, Inc., 4723 Elm Street, Bethesda 17, Md., offers a 4-page Catalogue H-10 describing a number of models of its Flash-O-Lens magnifier as well as other magnifying equipment. For your copy, use Reader Service Card.

L—188. Packaged-Gas Burner Data—Bulletin 7C issued by Bryant Heat Company, Industrial Division, 1020 London Road, Cleveland 10, Ohio, is a comprehensive collection of data on the manufacturer's Pow-R-Semblies or packaged industrial gas burner assemblies complete with pressure blowers. Capacities, specifications, dimensions and alternative assemblies are described for the units, which are applicable to boilers, air heaters, dryers, ovens and other equipment to which open burners with controlled flames are suitable. Sizes range from 4,400,000 to 6,600,000 btu/hr output. For your copy, use Reader Service Card.

L—189. Solvent Vapor Degreasers—G S. Blakeslee & Company, Cicero Station, Chicago 50, Ill., has issued a 20-page, two-color booklet which describes and illustrates its patented degreasing process for cleaning metal and alloy parts. Small and large equipment is illustrated, and each illustration is accompanied by a detailed explanation. For your copy, use Reader Service Card.

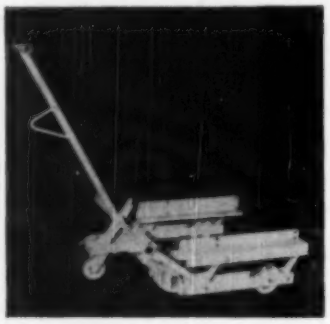
L—190. "Chemical and Electroplated Finishes", the book by H. Silman that was reviewed in the September issue of PLATING, is now available from The Sherwood Press, P. O. Box 566, Pacoima, Calif., at $10.00.

L—191. Paint Circulating Systems—Paint circulating systems, which enable manufacturers to finish parts and subassemblies in different departments of a plant and have them come together on the assembly lines in perfect color match and finish, are described in Bulletin No. 550, of Binks Manufacturing Company, 3114 Carroll Avenue, Chicago 12, Ill.

All paint materials are mixed at a central location, where color, viscosity, and other characteristics can be controlled under laboratory conditions. From here materials are piped to spray stations located at any point throughout the plant. Lower insurance costs, economies in handling, transportation and storage, as well as more efficient and lower-cost production are said to make such installations profitable to industries using as little as 50 gallons of paint a day. For your copy use Reader Service Card.

L—192. Adjustable Tote Pan Lift Truck—The new Tote Pan Lift Truck manufactured by Lyon-Raymond Corporation, 1324 Madison Street, Greene, N. Y., is described and illustrated in its Circular No. 271.

The new truck, which is adjustable in width and lowered height, is offered in two styles, a narrow model designed to handle tote pans from 8 to 16 inches wide



and a wide model designed to carry pans ranging in width from 16 to 24 inches. The height of the lifting forks can be adjusted from 2½ inches to 7½ inches. Loads up to 1000 pounds can be elevated by a single downward movement of the towing handle. The forms automatically lock in the raised position and are released by a simple pedal arrangement. For your copy, use Reader Service Card.

L—193. Storage, Handling and Feeding of Activated Carbon—Of interest to all users of activated carbon is this 12-page pamphlet recently published by Industrial Chemical Sales Division, West Virginia Pulp and Paper Company, 230 Park Avenue, New York 17, N. Y. The information was originally intended for the water purification field and first appeared in Industrial's book, "Taste and Odor Control in Water Purification". However, the problems in storing, handling, and feeding of activated carbon are practically the same throughout all industry and this reprint is now available to all users of activated carbon. The booklet discusses in some detail the shipment, storage and handling of activated carbon, bag emptying equipment, fundamental consideration in feeding, supplement to dry feed equipment, and solution feed equipment. For your copy, use Reader Service Card.

L—194. Motor Generator Sets—A Catalog G-102, issued by Hanson-Van Winkle-Munning Company, Matawan, N. J., on dc motor-generator sets for all low-voltage applications (electro-plating, -cleaning, -polishing, -coloring, anodizing, etc.) lists and illustrates generators in sizes from 300 to 40,000 ampere at 6 to 40 volt. It describes in detail construction features and includes general specifications. For your copy, use Reader Service Card.

L—195. Stainless-Steel Thermometer—A new 4-page bulletin which describes the Dillon stainless-steel thermometer has been issued by W. C. Dillon & Company, Inc., 5410 W. Harrison Street, Chicago 44, Ill. The instrument covers practically every industrial use and has features not found in usual fluid or expansion types. It comes in 5-, 3-, 2½- and 1-dial sizes and stem lengths from 4 to 42 inches. Especially noteworthy is its large heat-resistant dial, easily read from considerable distance. Calibration is for maximum accuracy in Fahrenheit scale, but Centigrade ranges are available. Overall metal construction is said to eliminate breakage even under conditions of severe vibration, or shock. It may be placed directly into hot materials without pre-heating; works equally well with liquids or gases; can be screwed into tanks, steam lines, exhaust systems, air ducts, boilers, refrigerators, or, with cork, floated in open tanks. With long stem length, it checks deep vats where there is heat variation from top to bottom. For your copy, use Reader Service Card.

L—196. Overhead Conveyor—An 8-page bulletin, entitled "Chain-O-Flex Conveyors" describes and illustrates the new flexible chain conveyor manufactured by the Chain-O-Flex Corporation, Franklin Park, Ill., and distributed exclusively by Industrial Equipment Company, 315 N. Ada Street, Chicago 7, Ill., and its representatives throughout the country.

Quick assembly of any practical conveyor system pattern is a prime feature:

all parts are bolted together like an Erector set; all corners are highly flexible and adjustable to any desired degree.

Variable speeds are obtained by adjusting the band wheel on the drive unit which will provide a 3:1 speed ratio.

Trade Literature

Multiple drive units may be used on extremely long systems. For your copy use Reader Service Card.

L—197. Forced-Air Space Heater—Heating Section, Dravo Corporation, Pittsburgh 22, Pa., has announced publication of a new 12-page bulletin (No. 523) describing the Dravo "Counterflo" forced-air space heater. Available in standard output capacities of from 400,000 to 2,000,000 btu per hour, the warm air heater is direct fired either by oil or gas and can be supplied with combination burners for quick conversion from one fuel to the other.

In addition to its primary use for comfort heating, the heater also can provide year 'round ventilating, process drying, tempering of makeup air, and heat curing. Long service life is assured by the heater's stainless steel combustion chamber. High efficiency (80 to 85%) is achieved by four-pass counter-flow combustion combined with a warm-air recirculation principle. For your copy, use Reader Service Card.

L—198. Working Conditions Affect Productive Efficiency—Estimates of the degree to which productivity of labor is influenced by labor's morale vary from 10 to as high as 30 per cent, states the Labor Relations Institute, 1776 Broadway, New York 19, N. Y. If that attitude is hostile, or even indifferent to the objectives of management, output is certain to suffer. Among the more important physical working conditions of plant and office which L. R. I. surveys have revealed as affecting labor productivity are (1) ventilation, including unpleasant odors, stale air, too high or too low humidity, unnecessary dust, etc.; (2) temperature, too high or too low temperatures leading to conscious resentment or outright inability to work; (3) illumination, too much or too little light creating eye strain that affects nerves and cuts worker productivity; and (4) noise, excess and unnecessary noise.

The Institute report emphasizes that "policing of working conditions is a job that's never finished. Periodic checks are necessary to assure that new annoyances have not developed since the last check was made". For your copy of the Institute report, including the complete check list of working conditions, use Reader Service Card.

L—199. Pipe and Fittings Catalog—An illustrated Catalogue Section M-38009 covering "Karbate" brand pipe and fittings is now available from National Carbon Company, Inc., 60 E. 42nd Street, New York 17, N. Y. It contains detailed engineering information including comprehensive tables of the chemical and physical properties of the material. All pipe sizes and fittings are illustrated and cross-section drawings show dimensions, assemblies, joining recommendations and other details to aid design work and to facilitate ordering. For your copy, use Reader Service Card.

L—200. Cleaning Metals Under Varying Conditions—A technical file folder from Cowles Chemical Company, Cleveland, provides data on 17 different metal cleaners. Practically any type of metal in widely varying condition can be processed by these cleaners which include silicated and non-silicated cleaners with and without organic surface active agents, foaming and non-foaming, alkaline and solvent emulsion. For your copy, use Reader Service Card.

L—201. Wet Deburring of Metals, Plastics, Rubber and Other Materials—Newest Wet-N-Dri flexible belt grinder especially suited to wet deburring of plastics, metals, rubber, glass, wood and other materials, is announced in new literature from Hammond Machinery Builders, Kalamazoo, Mich. Advantages reported include free belt, contour, or platen finishing, with belt widths up to 2½ inches. For your copy, use Reader Service Card.

L—202. Gloves—Dunn Products, 1214 W. Madison Street, Chicago 7, Ill., has issued two bulletins describing its line of fabric, leather, coated-fabric, and plastic gloves. For your copies, use Reader Service Card.

THE BEST PROTECTION AGAINST CORROSION COSTS LESS IN THE LONG RUN . . . . . .

TYGON

CORROSION-RESISTANT PLASTIC

PAINT

HALFWAY protection is worse than none where corrosion is a problem. Ordinary paints provide only a shield behind which corrosion goes on, uninterrupted. Be sure. Play safe. Protect your plant and its equipment with the paint proven over a 10-year period as the paint impervious to attack by most acids and alkalies.

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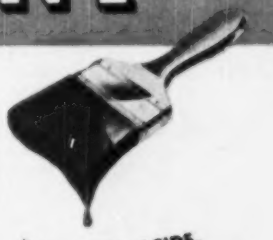

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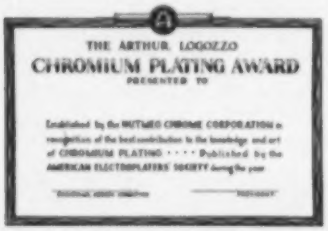
MANUFACTURERS OF CORROSION RESISTANT MATERIALS & EQUIPMENT SINCE 1865

A. E. S. News

Chrominum Plating Award

The certificate shown below accompanies the $50.00 prize offered by A. W. Logozzo and the Nutmeg Chrome Corporation. It was designed by Louis C.


THE ARTHUR LOGOZZO
CHROMIUM PLATING AWARD
PRESENTED TO

Established by the NUTMEG CHROME CORPORATION in recognition of the best contribution to the knowledge and art of CHROMIUM PLATING · · · · Published by the AMERICAN ELECTROPLATERS SOCIETY during the year

Orndorff, a young Baltimore artist who studied at Johns Hopkins University and the Maryland Institute and who is now an instructor in design, anatomy and drawing at the same institute.

The purpose of the award is to stimulate development in the field of chromium plating, both decorative and industrial, and publication of the findings in the Society's publications, this journal and the Proceedings.

The Movie "Tin Plate"

Requests for this movie should be addressed to the U. S. Bureau of Mines, Mr. Louis F. Perry, Supervising Engineer, 4800 Forbes Street, Pittsburgh, Pa., which has available 100 copies, and not to Weirton Steel Company or A. E. S. President, S. S. Johnston.

Electroplating Course in New York City

The School of Technology of the City College of New York began a course in Practical Electroplating on February 14. The primary object of this course, which will continue for 12 weeks, one evening a week, is to provide commercial electroplaters with a sound understanding of the principles underlying their work.

It is planned to give this course again in September. An announcement will appear in PLATING.

Copies of January and March Issues Desired

The Executive Office has only a few copies left of the January and March, 1948 issues of PLATING.

If those who do not plan to keep their copies would send them to P. O. Box 168, Jenkintown, Pa., their assistance will be very much appreciated.

A. E. S. CONVENTION

SCHROEDER HOTEL, MILWAUKEE, WIS. — JUNE 27 - 30, 1949

Pre-registration for the Milwaukee Convention is reported very heavy, and those of our readers who have not already done so should get their reservations in without delay. Reservations should be sent directly to the hotels listed in the March issue or on the Reservation Form sent to all on the Society's mailing list.

Attendance at the Convention should be a must for all interested in plating and allied processes. It offers unequalled opportunities to meet the leaders in the industry and hear them describe the latest developments in their fields, to listen to and partake in discussions of papers and in the Round Table Discussion on practical plating subjects, to visit plating plants in the Milwaukee area and see "how the other fellow does it", and to make the acquaintance of men with similar problem but different solutions to them. No one who possibly can come should let the chance slip through his fingers.

A very special invitation is extended to new members of the Society. They will be amply repaid in new information and new friendships for any efforts they have to make in order to come and will gain worthwhile insight into the operation of the Society and its importance in the industry.

The plans of the host Branch to entertain the Convention are rapidly taking form, and all visitors can look forward to a pleasant time, in Old Milwaukee fashion, in their off-hours. In addition to the general entertainment program the ladies will find much with which to occupy themselves while their husbands attend the sessions.

The papers which have been offered to or solicited by the Editorial Board cover a wide range of important topics. Of special interest is the Symposium on Finishing of Light Metals, a subject which is becoming increasingly significant in the industry and with which everyone should be conversant. Of equal interest to management and operating personnel should be the Symposium on Plating as a Business, a subject which has not always been given the attention it deserves. It will include a statement by competent authorities on the present attitude of customers toward plated products, on the place of the job plating shop in the industry, and on quality control of plating, as well as up-to-the-minute information about availability of plating materials.

Plan to attend, now!

Committee Studies Public Relations Policy for Electroplating Industry

A Special Advisory Committee of the American Electroplaters' Society is shown studying a public relations program for the electroplating industry at a recent meeting in Detroit. Left to right, members of the Committee are: C. F. Nixon, Director of Process Engineering, Ternstedt Division, General Motors Corporation, Detroit, Mich., and A. E. S. Third Vice-President; L. M. Hague ,President, Hanson-Van Winkle-Munning Company, Matawan, N. J.; D. X. Clarin, District Manager, Oakite Products, Inc., New York, N. Y., and Chairman of A. E. S. Public Relations Committee; W. M. Phillips, Chairman of the Special Committee and Head of Electrochemistry Department, General Motors Research Laboratories, Detroit, Mich.; R. M. Shack, Executive Secretary, National Association of Metal Finishers, Detroit, Mich.; A. R. Putnam, A. E. S. National Office, Jenkintown, Pa.

In 80 seconds washer tubs come clean prior to enameling ...with PENNSALT METAL CLEANERS

When a huge press throws a 1000 ton punch into 18 gauge steel, it really pounds the drawing compound into the steel surface. In other words, a tough cleaning job pops up.

Yet 80 seconds' spray treatment with Pennsalt Cleaner solutions enables Heintz Mfg. Company to dig that soil out . . . leaving these home washer tubs clean and ready for the pickling and porcelain enameling operations.

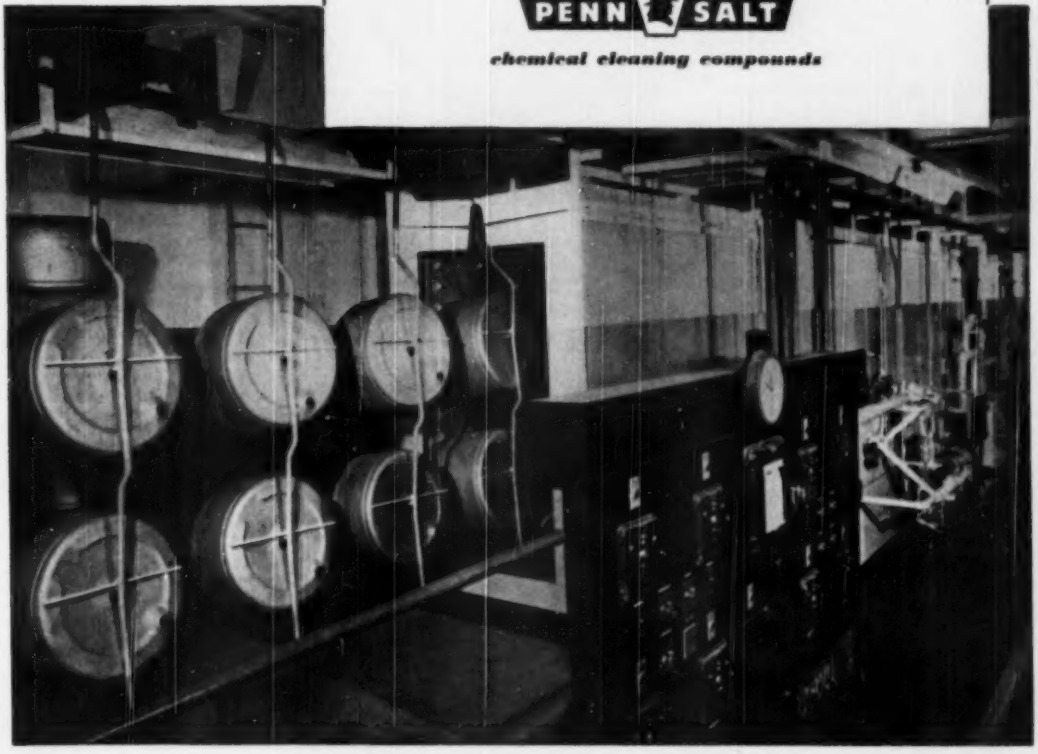
In this method, Pennsalt EC-12* and Pennsalt* 30 have done such a fast, efficient job that Heintz has had no cleaning rejects since the installation was made.

Satisfactory cleaning like this is being enjoyed all over the country by plants using Pennsalt Cleaners. Call in your Pennsalt representative, he'll be glad to discuss with you savings of time and money with Pennsalt's complete line of metal cleaners. Special Chemicals Division, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.

*REG. U. S. PAT. OFF.

PENN SALT

chemical cleaning compounds



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A. S. T. M.-A. E. S. SPECIFICATIONS FOR PLATED COATINGS

All numerical requirements refer to minima on significant surfaces.

Zinc on Steel: A164

Coating	Type G.S.	Type L.S.	Type R.S.
Zinc, inch	0.001	0.0005	0.00015

Cadmium on Steel: A165

Coating	Type N.S.	Type O.S.	Type T.S.
Cadmium, inch	0.0005	0.0002	0.00015

Nickel-Chromium on Steels: A166

Coating	Type D.S.	Type F.S.	Type K.S.	Type Q.S.
Copper plus nickel, inch	0.0020[a]	0.00125	0.00075	0.0004
Final nickel, inch	0.0010	0.0006	0.0004	0.0002
Chromium (if required), inch	0.00001	0.00001	0.00001	0.00001
Resistance to standard salt spray, hours without appreciable corrosion	96	72	48	16

[a]When copper is used in excess of a thickness of 0.0001 inch, its minimum thickness shall be 0.00075 inch.

Nickel-Chromium on Copper and Copper-Base Alloys: B141

Coating	Type F.C.	Type K.C.	Type Q.C.
Nickel, inch	0.0005	0.0003	0.0001
Chromium (if required), inch	0.00001[a]	0.00001	0.00001

[a]Maximum thickness should be kept below 0.00005 inch to prevent cracking.

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Nickel-Chromium on Zinc and Zinc-Base Alloys: B142

Coating	Type F.Z.	Type K.Z.	Type Q.Z.
Copper plus nickel, inch	0.00125	0.00075	0.0005*
Copper, inch	0.0004	0.0003	0.0002
Final nickel, inch	0.0005	0.0003	0.0003
Chromium (if required), inch	0.00001	0.00001	0.00001
Resistance to standard salt spray, hours without appreciable corrosion	48	32	16

*Total of 0.0003 inch if alternative of nickel only is used.

Lead Coatings on Steel: B200

Type	Copper inch	Lead inch	Salt spray Resistance* hours
E.S.	.....	0.0010	96
EE.S.	0.000015	0.0010	96
M.S.	.....	0.0005	48
MM.S.	0.000015	0.0005	48
P.S.	.....	0.00025	24
PP.S.	0.000015	0.00025	24

*To standard salt spray test in hours without appreciable corrosion.

Chromate Finishes on Zinc: B201

With two crossing, 1-inch long scratches through the chromate coating only, the part shall show no white corrosion visible to the unaided eye at normal reading distance after 24 hours in a standard salt spray test.

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Branch News

COMING EVENTS

INDIANAPOLIS BRANCH

ANNUAL EDUCATIONAL MEETING
AND BANQUET
Saturday, April 9
in Indianapolis Athletic Club

Educational Session at 1:00 P. M.
Speakers: Mr. Frank K. Savage, Vice-President, Graham, Crowley and Associates, Inc.
Mr. J. D. Patrick, Westinghouse Electric Corporation
Mr. G. A. Lux, Oakite Products, Inc.

Banquet in the Evening
Dinner—floor show—dancing
Tickets at $5.00 per person from Mr. W. W. Cochran, 7050 N. Pennsylvania Street, Indianapolis, Ind.

R. O. SHOCKLEY,
Librarian

BOSTON BRANCH

14TH ANNUAL TECHNICAL SESSION
AND BANQUET
Saturday, April 16
in Hotel Statler
Technical Session at 1:45 P. M.

Chairman, Arthur W. Logozzo, President, Nutmeg Chrome Corporation, Hartford, Conn., and A. E. S. First Vice-President
Movie in Technicolor, "Tin Plate", showing operations at Weirton Steel Company, Weirton, W. Va.
"Disposal of Plating Room Waste", Dr. C. Fred Gurnham, Consulting Engineer and Chairman, Department of Chemical Engineering, Tufts College, Medford, Mass.
"Levelling of Electrodeposits", Myron B. Diggin, Technical Director, Hanson-Van-Winkle, Munning Company, Matawan, N. J.
"Outline of Simplified Plating Controls", R. O. Hull, President, R. O. Hull & Co. Inc., Cleveland, Ohio

Banquet in the Evening
GEORGE P. SWIFT,
Secretary-Treasurer

TENTH ANNUAL NEW ENGLAND REGIONAL MEETING

Satuday, April 30
Hotel Kimball, Springfield, Mass.
Educational Session at 2:00 P. M.
Banquet in the Evening
Dinner, Entertainment
Tickets at $5.00 per person from L. Fountain, 15 Cortland Street, Springfield, Mass.

JAMES LAING,
Meeting Secretary

BUFFALO BRANCH REGIONAL MEETING

Saturday, May 7
Hotel Markeen, Buffalo, N. Y.

Educational Session in the Afternoon
Symposium on "Purification and Filtration—from Water to Plating Solutions"
Speakers: Harold Faint, Industrial Filter and Pump Manufacturing Company; Walter A. Hellbig, Darco Corporation; and others
Special Entertainment for the Ladies
Gala Banquet in the Evening
Tickets at $5.00 per person from Joe Ruff, 1492 Berg Road, Buffalo 19, N. Y.

H. A. FUDEMAN,
Secretary

ADELAIDE BRANCH

The first general meeting in 1949 was held in February when the following officers were elected to control Branch affairs during the current year:

President—G. C. GEDDES, Chief Testing Engineer, Islington Railway Workshops
Immediate Past-President—I. W. WILES
Secretary—B. H. S. DAY
Treasurer—B. QUIST
Board of Managers—J. AUSTIN, W. J. BLANCH, T. F. PEARCE, W. FISCHER, H. MATTERS

The balance sheet for 1948 was presented and passed and the proposed Branch By-Laws were adopted without amendment.

The incoming President was introduced by I. Wiles and then addressed members with a very interesting talk on "Alternative Methods of Finishing". The discussion which followed indicated that the members were interested in al branches of metal finishing.

With Mr. Geddes' wide experience and capable leadership we look forward to another good year.

BASIL DAY,
Hon. Branch Secretary

BALTIMORE-WASHINGTON BRANCH

The February meeting was held in the Crown Cork and Seal Company's plant in Baltimore on February 8, 1949.

A baked ham dinner was served to over one hundred and fifty members and guests through the courtesy of the host company. During the dinner, the Crown Glee Club under the direction of FRANK BELL, Assistant Chief Engineer, rendered several selections. After the dinner, A. E. S. PAST PRESIDENT KENNETH HUSTON gave a brief outline of the growth of the Society, recent accomplishments of the Executive Board, and the aims of the Executive Board for the coming year.

During the tour through the Closure Division which followed, operations were observed pertaining to cold reduction of strip steel, vertical continuous annealing of steel, skin pass reduction, continuous electrolytic tin plating, continuous sheet lacquering, lithographing, closure-shell forming, and closure assembly. The Machinery Division was also visited. Here were seen operations pertaining to grinding, buffing, plating, heat treating, wheel abrading, machinery painting, and assembling of carbonators, soft drink and beer bottling machines.

Details of the plant trip were arranged by members CHARLES GLOCK, Metallurgist in the Closure Division, and PHILIP WRIGHT, Superintendent of Finishes in the Machinery Division. The Branch was welcomed to the plant by MR. JAMES WRAY, General Manager of the Machinery Division. The Crown Cork and Seal Company is a sustaining member of the Society.

This plant visitation served as an excellent demonstration of the many ways in which metal finishing operations enter into the fabrication of items which we use every day without realizing the effort required in their manufacture.

FIELDING OGBURN,
Secretary

BRIDGEPORT BRANCH

Two new members were elected at the meeting on January 7, and there were three new applications for membership and one in-transfer.

A letter was read from MR. JULIAN A. SCHON, Librarian of Bridgeport Public Library, which included a list of the substantial collection of books on plating and finishing now available. This collection is the result of devoted work on the part of LAURA ALICE EALES who had charge of the Technology Department until her recent demise. A letter of tribute to her memory had been written by our member FRANK W. ROCK and published in the Bridgeport *Post*.

Following a panel discussion of plating and finishing subjects with V. CONSALVO, A. CHENIS, H. M. GOLDMAN, CARL SCHAEFER and RAY KWASNIK as "judges and experts", refreshments were served, courtesy FRED B. GOTHARDT of Magnuson Corporation, Brooklyn, N. Y.

JOSEPH G. STERLING,
Secretary-Treasurer

BRIDGEPORT BRANCH

Thirty-five members and guests heard MR. HAROLD NARCUS, President of Electrochemical Industries, Inc., Leominster, Mass., give his Convention paper, "Electrodeposition of Metals on Plastics, Employing Reduced Copper Films" at the Open Meeting and Educational Session on January 21. His interesting talk was accompanied by a number of exhibits and followed by considerable discussion.

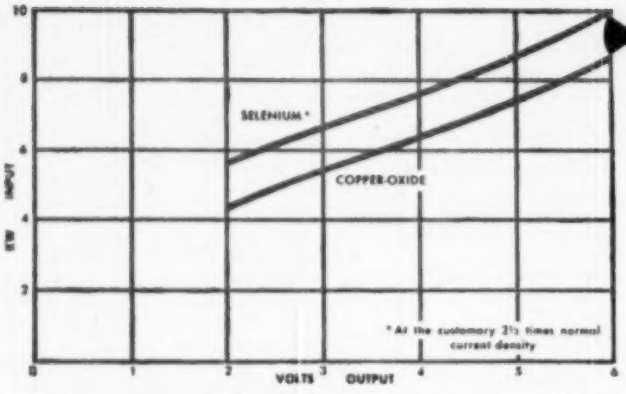
JOSEPH G. STERLING,
Secretary-Treasurer

Here's how

COPPER-OXIDE RECTIFIERS

cut your power costs

15% less power for typical plating job



This curve shows power consumption for 1000-ampere electroplating operations at varying voltages. All data is based on the most efficient practical circuit for complete plating rectifier and regulator equipment. The copper-oxide curve is based on G-E fan-cooled rectifier stacks. The selenium curve is based on fan-cooled stacks operating at the usual 2½-times-normal current density.

Greater Efficiency — At six volts d-c output, copper-oxide rectifiers show a 15% decrease in your power costs. With 3 volts d-c output, the difference is even greater — 18 per cent in favor of copper oxide.

Long Life—Copper-oxide rectifier cells age only slightly during the first year and then are stable. Their life is practically unlimited. As proof, the majority of all rectifiers in service over five years have copper-oxide stacks. Some stacks have been in service for over 20 years.

Proved in Service — Installed capacity of G-E copper-oxide rectifiers, in the plating industry alone, is over 5,000,000 amps.

General Electric makes all types of rectifiers. We could choose either copper-oxide or selenium stacks for electroplating equipment. However, considering the greater efficiency and more stable aging of copper-oxide stacks as compared with selenium, we use only copper-oxide rectifiers for our plating equipment.

Your plating equipment represents a major investment. Get all the facts before you choose. Your local G-E representative, who handles both copper-oxide and selenium rectifiers, is in a position to give you impartial facts on plating rectifiers. Ask him to give you Bulletin GEA-5247. Or write *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

456-301

BOSTON BRANCH

Among the actions of the business meeting on February 3 were the election of one new member and the decision to try to hold a meeting in Worcester on May 19, under the supervision of HAROLD NARCUS.

Later LIBRARIAN GLOVER introduced MR. B. G. DAW, President of Lasalco, Inc., St. Louis, Mo., whose topic was "What Happens in a Plating Barrel?" Having first discussed the widely varying area-volume ratio of screws and the changes in current drawn with size of barrel and load, he showed a color film which illustrated how load distribution varies with load size and barrel speed. He then showed a film depicting burnishing, and finally excellent views of a trip through the Grand Canyon. Many questions from the floor followed the presentation.

GEORGE P. SWIFT,
Secretary

BUFFALO BRANCH

The February 4 meeting was highlighted by the presence of MR. GEORGE CAVANAUGH of the General Electric Company, who gave us his views on "Corrosion—Stainless Steel and Galvanic Types". Mr. Cavanaugh began his talk by outlining the types of metal corrosion and proceeded to explain them with the aid of a

Cavanaugh

revealing collection of pictures and photomicrographs. Of particular interest are his data on Type 346 stainless steel, a titanium alloy, which has higher corrosion resistance than 18-8 nickel-chromium alloys. Many physical properties of the titanium alloy may make it a strong competition to better known types of stainless steel.

H. A. FUDEMAN,
Secretary

CHICAGO BRANCH

The regular monthly meeting, held in the Atlantic Hotel on February 11, was attended by one hundred and ten members. Among visitors were MR. HENRY MAHLSTED of United Chromium, Inc., New York City, who took part in the discussion later in the meeting.

The speaker for the evening was MR. JOHN DAVIS of Udylite Corporation, Detroit, who gave an interesting talk on automatic plating equipment. Most

Said to be a true representation of the very successful Grand Rapids Branch affair on January 29, reported in the March issue.

profitable were the points brought out why full-automatic equipment is often less expensive over a period of years than manual set-ups: (1) usually floor space is saved; (2) original installation of services such as electricity, steam and water costs considerably less; (3) size of racks can be built to fit the equipment rather than being limited by what an operator can handle; (4) headroom space is occupied by useful equipment; (5) ventilation and exhaust equipment is usually less expensive to install.

His speech was followed by the usual open discussion with many of the members participating.

The second half of the Electroplating course at the Illinois Institute of Technology began February 17, 1949. Members who missed this first course should keep next fall in mind and plan to attend then.

A. G. BARTMANN,
Correspondent

COLUMBUS BRANCH

The Columbus Branch engaged in a visit to the D. L. Auld Company of Columbus on February 4, the visit serving as the February meeting. MR. LEON HAAS, Supervisor of Plating for the Auld Company and an A. E. S. member, conducted the tour and discussed the extensive installation needed to conduct modern bright plating on a large scale.

The process, starting with the stamping operation, was followed through the buffing and automatic bright nickel and chromium plating. Another process of great interest was the finishing of ornamentation which incorporates both ceramics and electroplating.

J. C. ZELEIN,
Second Vice-President

DAYTON BRANCH

The Fourth Annual Educational Session and Dinner-Dance on February 12 was a great success. The eighty-five members and guests who attended the Educational Session appreciated the able chairmanship of A. E. S. PRESIDENT S. S. JOHNSTON of Weirton Steel Company. The lively discussions which followed the presentation of the papers testified to the interest aroused by the speakers and their subjects: MR. GEORGE W. JERNSTEDT, Manager of Electroplating Projects, Westinghouse Electric Corporation, East Pittsburgh, Pa., on "PR Plating"; DR. LOUIS WEISBERG, Consultant, New York City and A. E. S. Research Committee Chairman on "Levelling in Nickel Solutions"; and DR. RALPH SCHAEFER, Director of Research, Cleveland Graphite Bronze Company, Cleveland, Ohio, and A. E. S. Research Committee Vice-Chairman on "A. E. S. Research Program". The Branch is indebted to them all.

The Dinner-Dance in the evening showed that the planners of the meeting are not only good technicians but also understand the more pleasant side of life. All of the three hundred and eighty members and friends with their wives seemed to have had a grand time, well worth the headaches of next day. Thanks are due to the many suppliers for their financial help and the refreshments. It was a great party, where science and "Gambrinus" were competing to the benefit of all.

The "Dayton Trophy" for attendance of Branch Meetings was again awarded to the Columbus Branch. A. E. S. VICE-PRESIDENT WILLIAM NEILL told us how it gets an attendance of at least 75 per cent of the members: as most members work at Battelle Institute where the meetings are held, the door is simply locked and no one is allowed to leave until after the meeting.

The "Toulmin Award" for the best paper went to MR. JOHN F. DAYMUDE of the Cincinnati Branch for his paper on "Galvanic Corrosion". Congratulations.

Two new members have been elected.

FRED BAUCH,
Secretary

JACKSON-LANSING BRANCH

On December 14 in Hotel Hayes, Jackson, The Solventol Chemical Products Company put on an excellent meeting with MR. J. R. EWING presenting a talk on "Cleaning Processes and Their Applications". The meeting and the entertainment will long be remembered by the Branch.

The Rinshed-Mason Company presented to a capacity house on January 11 in Hotel Porter, Lansing, an informative and entertaining program at which MR. N. P. BECKWITH gave an enlightening discussion of "The Laboratory Evaluation of Surface Coatings". The meeting concluded with the company's latest techni-

Branch News

color movie entitled "The Protective Dimension".

The Hotel Hayes, Jackson, was the locale for a meeting sponsored by the Parker Rust Proof Company on February 8. Mr. M. B. Rogna talked about "Modern Phosphate Coating Methods", and described a new chemical brightening method for aluminum called the "Lustrik Process". The very worthwhile meeting was terminated with the showing of State of Michigan conservation films.

L. M. Henderson,
First Vice-President

LANCASTER BRANCH

"Ted" Schwalm and "Cris" Brubaker were hosts to the Lancaster Branch when it met on February 11 at the Schwalm Manufacturing Company.

Frederick Schreiber introduced the guest speaker, Mr. Richard Hazen of Randolph Products Company who spoke about "Present Trends in Organic Finishes". He noted that the organic finishing industry is gradually returning to the materials prevalent before the war, the "ersatz" materials of the war years being that and little more. While some of the new materials hold promise and while others are excellent blend components, there has not been the predicted revolution in organic finishes. The speaker expressed the opinion that when things go wrong the plater should not blame the finish manufacturer; experience had proven to him that almost without exception the fault lies with methods, shops, or products.

The talk was followed by refreshments served by the courtesy of the hosts and by movies depicting beauty scenes from various parts of the world.

C. W. Smith,
Secretary-Treasurer

LOS ANGELES BRANCH

The February meeting of the Los Angeles Branch, A. E. S., was held at Scully's Restaurant, February 9, 1949.

Speaker for the evening of February 9 was Mr. Jerry Levy, Cooperative Industries, Chester, N. J., who spoke about filtration through porous stone membranes and demonstrated a small model of this type of filter. He explained methods of coating the filter and proper filtration procedures.

Progress on the Guidebook to be published by the Branch in March was reported by the committee in charge. The technical articles have been completed and a sizable quantity of advertising has been secured. Bob Longacre, a member of the Los Angeles Branch who is associated with Western Finishing Magazine, was given a vote of thanks for time and effort he has spent on the layout and other details of publishing. The Guidebook promises to be a worthwhile addition to the literature on plating.

Plans are already being made for the 1951 A. E. S. Convention to be held in Los Angeles. Don Bedwell is General Chairman and has selected R. J. Wooley as Co-Chairman.

George M. Kent,
Secretary

LOUISVILLE BRANCH

At a special dinner meeting held at 6:30 P. M., February 19, at Bauer's Park just outside of Louisville, Mr. William J. Neill, A. E. S. Second Vice-President, presented the Louisville Branch with a permanent charter.

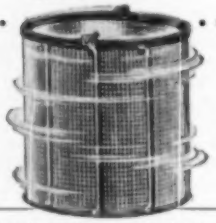
The meeting was attended by a large majority of the members and such notable guests as Mr. Ed Brueck, President of the Indianapolis Branch, Mr. John F. Soderberg, the speaker and our guest, from Columbus, Ohio, and Mr. Donald L. Patrick, Louisville Branch President under our temporary charter before his transfer to Indianapolis, as well as some of the wives of the members and guests from Cincinnati.

Mr. Neill, along with the formal presentation of the charter, explained the work of the National Officers and the advantages of attending the Convention, especially the advantages to the ladies, and discussed the work of the society in general. After President Steidle had thanked the speaker, several of the guests and members expressed their feelings about the Society and its important functions.

PAYS FOR ITSELF... *IN TIME SAVED*

Kreider Dryer with auxiliary steam heating unit (illustrated). Auxiliary natural gas heating unit available; also standard model without auxiliary heating.

Basket (below). Heavy gauge woven steel mesh over steel frame. Capacity, 1140 cu. ins.



Spin-Dries* up to 50 pounds in less than 2 minutes

Saves drying time. Kreider Dryer operates on ¾ h.p. at 625 r.p.m. . . . cuts drying time to as little as 35 secs.—no more than 2 mins.—for each 50 lbs.

Saves production time. Runs at top speed with maximum load, hour after hour, day after day. Ends drying "bottle necks" . . . assures smooth, evenly dried surfaces, longer lasting lustre—fewer "rejects."

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*Only 2 simple steps required. . .

(1) Operator places wire mesh basketful of small parts in Dryer . . . turns motor "ON."

(2) Operator turns motor "OFF" . . . presses foot brake . . . removes basket.

NEW HOLLAND *KREIDER* DRYER

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The food and drink were excellent and a wonderful time was had by all.

New members were inspired by the presentation of the charter. Our thanks go to Mr. Neill and the Society Officers.

S. J. Beyer,
Secretary-Treasurer

MELBOURNE BRANCH

The Fourth Annual Meeting of the Branch was held on January 24 in the Chamber of Manufacturers. First business was the adoption of the Auditor's Report and Balance Sheet which showed a sizable deficit for the year. This latter formed the argument for an increased scale of dues which had been incorporated in the new Branch By-Laws adopted by the meeting.

Election of office bearers for 1949 resulted as follows:

President—K. Leigh

First Vice-President—J. W. McOrist

Second Vice-President—G. H. Heid

Secretary-Treasurer—J. J. Dale

Librarian—H. A. Teague

Board of Managers—A. H. Chesterfield, H. I. Lattauer and G. A. Noy

The retiring President, Glen Walker, gave a report of the Branch's activities during the past year and thanked the Committee for its help. The Secretary, replying on behalf of the members, paid a warm tribute to the President's contribution towards the progress of the Branch during a difficult year.

J. J. Dale,
Hon. Secretary

MILWAUKEE BRANCH

In the absence of President Hartshorn, First Vice-President Everett Robinson conducted the 397th regular meeting on February 4.

Delegates were elected to the coming Convention to be held in Milwaukee this June. Two men were elected to membership.

Librarian Les Diveley introduced Mr. William Phillips of General Motors Research Laboratory, Detroit, who gave an interesting talk on "Latest Developments in Judging the Quality of Plated Parts". A very lively question and answer period followed.

Harry J. Krueger,
Secretary-Treasurer

NEWARK BRANCH

Forty-five members and guests were present at the meeting on February 4, at which three new members were received.

The guest speaker, Mr. H. K. DeLong, Superintendent of Finishing in the Magnesium Division of the Dow Chemical Company, was introduced by Librarian Bowerman. Mr. DeLong read a paper on "Electroplating of Magnesium", which was supplemented by a series of lantern slides, depicting in detail the steps in the plating of metals on magnesium. He stated that securing a good zinc film by immersion without current in an alkaline pyrophosphate-fluoride bath containing zinc is the key to success in plating on magnesium and its alloys. Once the film of zinc has been applied, other metals such as copper, cadmium, chromium, etc., may be plated directly on it. Best adhesion of subsequent electrodeposits is obtained by first applying a copper strike deposit.

It was pointed out that copper-nickel deposits on magnesium are successfully applied in barrels. The results of this method were vividly demonstrated with samples of barrel-plated parts given to the audience.

Samuel S. Frey,
Recording Secretary

NEW YORK BRANCH

All officers and seventy-three members were present at the meeting on January 14 when Mr. John McLean of the Bulova Watch Company discussed "The Manufacture and Plating of Watch Dial Faces".

Mr. McLean showed samples of the various finishes on tone dials. More important, however, were his formulae and methods of producing the desired effects. The step by step procedures of stamping, embossing, stopping off, plating, relieving, stopping off, etc., were discussed in relation to various dials. As a good pickle for fire scale removal from brass was mentioned 50 per cent hydrochloric acid saturated with oxalic acid. Mr. McLean's talk was abundant with valuable information, and further queries by the members added even more.

Albert G. Fusco,
Recording Secretary

NEW YORK BRANCH

Two applications were received at the meeting of January 26, attended by one hundred and ten people who came to hear the talk and see the demonstration of "High Speed Bright Brass Plating" by Messrs. McKenna and Cates of the Enequist Chemical Company. In the preparation of the recommended solution the water must be boiling when the salts are added in order to be operative. After the use of degreasing had been discouraged, the speakers advised the following procedure for zinc die castings: (1) emulsion clean, (2) alkali soak clean, (3) dip in inhibited 5 to 10 per cent fluoboric acid, (4) brass plate in a bath containing 16 to 18 oz. sodium cyanide and 16 to 18 oz. Enequist H. S. Brass Salts to 1 gal. water and maintained at *p*H 12.2-12.8, free cyanide 3 oz/gal. Anode to cathode ratio was 2:1 with special carbon and copper anodes in 1:1 ratio, temperature 85 to 130° F, current density 20 to 150 asf requiring 2½ to 6 volts. Tank and

ELECTROPLATING AND POLISHING EQUIPMENT

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Take advantage of our practical experience.

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coils are made of steel. Rapid deposition of close-grained, uniform, ductile coatings of good buffing quality and ease of brass-color control are claimed for the bath. Rate of deposition was said to be 0.00015 inch per minute at 120 asf. A 6-minute deposit on rough steel was said to be sufficient subsequent buffing operations.

ALBERT G. FUSCO,
Recording Secretary

PHILADELPHIA BRANCH

Forty members and guests attended the dinner meeting in the Broadwood Hotel on February 25 at which MR. C. R. FISCHRUPP, Western Electric Company, Chicago, gave an illustrated talk on "Current Industrial Methods for Zinc, Nickel and Chromium Plating in Automatic Equipment" as used by Western Electric in the manufacture of telephone equipment. Mr. Fischrupp's talk was well presented and evoked an interesting discussion.

The secretary reported the passing of EUGENE ZURBACH, Sr. and ALEXANDER M. ROSSON (see Personals in this issue).

Seven new active members were admitted and five new applications were received; there were also two transfers and one reinstatement.

Nomination of officers for the 1949-1950 term was held with the following result:

President—DR. SAMUEL HEIMAN
First Vice-President—GEORGE GIBBS
Second VicePresident—ROBT. GRAHAM
Secretary—I. WILLIAM MARCOVITCH
Treasurer—GEORGE M. LONG
Librarian—ALBERT HIRSCH
Board of Managers—NAT VERRELLE, ROBERT L. FARREN, JR., WILLIAM H. TRUSDELL
Delegates—THOMAS M. RODGERS, I. WILLIAM MARCOVITCH, GEORGE M. LONG
Alternates—FRED FULFORTH, GEORGE GIBBS, DR. SAMUEL HEIMAN

I. WM. MARCOVITCH,
Secretary

PITTSBURGH BRANCH

The regular meeting was held on February 10 in the Ballroom of the Sheraton Hotel.

The Chairman of the Ladies' Night Committee, A. KAUPE, reported that the Ladies' Night would be held in the same place on April 21. Judging from his report the committee has a very nice evening in store for members and friends of the Branch.

MR. C. R. FISCHRUPP of the Western Electric Company gave a very interesting and instructive paper on "Current Industrial Methods of Plating Zinc, Nickel, and Chromium in Automatic Equipment". His slides showed the unique equipment and method employed for rapid loading and unloading of small parts. Following the paper he led an interesting discussion of automatic equipment and plating racks for small parts.

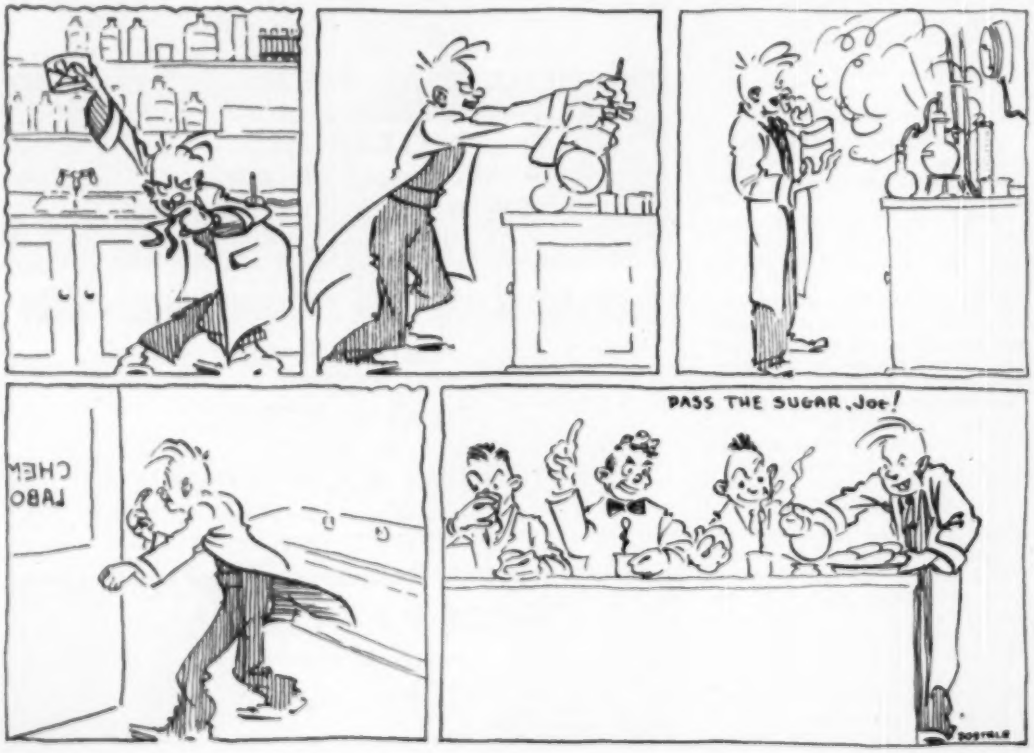
GLADE B. BOWMAN,
Secretary-Treasurer

ROCHESTER BRANCH

A regular monthly meeting was held on January 21 in Hotel Seneca, PRESIDENT ROBERT FLINT presiding.

The Secretary announced that the Green Electric Company had donated a Rectifier to the Metal Finishing class at the Rochester Institute of Technology, a contribution to the "advancement of the science of electroplating" which is most appreciated.

Letters were ordered sent to the following firms to thank them for their donations



of door prizes to the Christmas Party: Frederick Gumm Company, Hanson-Van Winkle-Munning Company, Maas & Waldstein Company, Oakite Products, Inc., Scobell Chemical Company, The Udylite Corporation.

The speaker for the evening was Mr. Ed MacAleer of the Formax Company, who presented a fine paper on "Buffing and Polishing Compounds".

James Weaver,
Secretary

SAGINAW VALLEY BRANCH

The February 9 meeting was a memorable occasion. Seventy-eight members and guests attended to witness the presentation of our permanent charter by Mr. S. S. Johnston, Weirton Steel Company, A. E. S. President. The round of applause following Mr. Johnston's talk left no doubt about the enthusiasm of the members and their pleasure in receiving this charter.

The program for the evening was a Round Table Discussion with a Board of Experts. To stimulate the discussion each gave a five-minute talk on the following topics:

Dr. R. B. Saltonstall, The Udylite Corporation: "In a copper, nickel, chrome cycle, is it more advantageous to use one rack for the whole cycle, or re-rack for chrome?"

Dr. M. M. Beckwith, The Harshaw Chemical Company: "Advantages and problems entailed in high speed plating".

Mr. Lyman Sperry, Doehler-Jarvis Corporation: "Disposal of cyanide solution by electrolysis of near boiling solution using steel or stainless anodes and cathodes followed by complete neutralization of the final traces of cyanide with sulphuric acid".

Mr. Earl Stadel, George L. Nankervis Company: "The design of plating equipment from a mechanical engineer's point of view, with special reference to adequate ventilation and filtration".

The literal avalanche of question cards following the talks certainly proved the interest of the members. In fact, it was the pleasure of those present to omit the film for the evening and continue the question period instead.

The door prize for the evening, a beautiful billfold presented by The Harshaw Chemical Company, was won by W. H. McCormick, Buick Motor Division, Flint, Mich.

A round of applause was given Joseph Farmer following the announcement that his company, The Lufkin Rule Company, had sent each member of the Branch a very clever six-foot "cocktail rule".

L. J. Minbiole,
Secretary

ST. JOSEPH VALLEY BRANCH

Forty members and guests attended the February meeting in Hotel Elkhart. One applicant was elected to membership.

A committee of three Past Presidents, John Lockerbie, Kenneth Harlan, and Chester MacDowell, was appointed by President James Heiges to nominate Officers for the coming year.

Librarian Mel Beremand introduced Mr. M. J. Moll of Hanson-Van Winkle-Munning Company who spoke on "Full Automatic Plating Conveyors and Their Applications". In his illustrated lecture, he demonstrated very convincingly how the automatic plating machine can be used practically and efficiently in both the job shop and mass production plant. His talk proved interesting to most of us, who have had very little, if any, experience with this type of equipment.

V. E. Peterson,
Secretary-Treasurer

SOUTHEASTERN BRANCH

With H. R. Stogner presiding, our regular meeting was called to order at 8:30 P. M. on February 10 in Robert Fulton Hotel.

Librarian Fred Fletcher was instructed to contact the library for the purpose of supplying it with Plating, the Branch to pay the first year's subscription if necessary.

The speaker of the evening was Mr. R. W. Kotz of Belke Manufacturing Company who gave a very interesting talk on "Racks and Racking", and illustrated his points with a number of sample racks.

The May meeting will be held in Birmingham.

Wm. T. Weymouth,
Secretary-Treasurer

TWIN CITY BRANCH

Robert L. Buckley of Industrial Chemical and Equipment Company lectured on "Practical Points in Chromium Plating" at the meeting on February 7, distributing copies of his lecture and miscellaneous tables concerning chromium plating to those present. Ralph B. Maddock of Pako Corporation then led the Round Table Discussion on the subject. Considerable interest was shown by those in attendance.

Following dinner, President Frank Ireland named to the Nominating Committee E. H. Lindemann, G. W. Lillicrop, Al Leonard, and Paul W. Felt; all four are Past Presidents. One new member was welcomed into the Branch.

Following the business meeting, movies of the 1948 Minnesota football games were shown by Phil Brain. They were greatly enjoyed by those present.

Robert L. Buckley,
Secretary-Treasurer

SYDNEY BRANCH

The meeting of February 8 in Air Force House was attended by only twenty-six members and visitors, the heat wave probably accounting for the comparatively small number.

Four new members were elected. The Balance Sheet for the preceding year showed the Branch to be in a very healthy state financially.

The incoming President, F. R. Bellenger, then delivered his Presidential Address. He stressed the urgent need of the plating trade to maintain the highest quality of workmanship and not to be influenced into turning out an inferior protective coating in order to get a particular job down to a price. A decline of standards eventually leading the public and manufacturers to seek alternative methods of rust prevention. He pointed out that a Standards Association is in existence, but that its findings were not generally known or adhered to. The President urged the platers to think progressively, keep abreast of new developments, and apply them in their own plants. He drew their attention to the fact that there are many processes applying electrochemistry in which their basic knowledge of electroplating would be of assistance.

The address proved most interesting to the members as evidenced by the lively discussion which followed.

T. O. Kolts,
Secretary

TORONTO BRANCH

The regular monthly meeting on January 14 was one of the most successful of this season with over forty members present at the banquet and well over a total of sixty to hear the guest speaker of the evening, Dr. R. B. Saltonstall of The Udylite Corporation, who spoke on "Trouble Shooting in the Plating Room". Dr. Saltonstall gave a very interesting and informative talk which was followed by a question period.

In place of the usual movie, a transcription was made of Don Simms' radio program, "What's Your Beef", in which a number of our members went on the air to voice their pet beef. The program was a welcome diversion from our usual run of business and the "beefs" presented much food for thought.

L. S. Williams,
Correspondent

TORONTO BRANCH

There was a fairly large turnout for the dinner on February 11, and a considerable number of members later joined the meeting to hear Mr. G. S. Mallett's of Anaconda American Brass Company interesting talk on "Copper and Its Alloys". Eddie McCutcheon won the lighter and cigarettes donated by Charlie Emberley of Emberley Enterprises. "Through the Kaiber Pass" was the film for the evening, kindly donated by Imperial Oil, Limited.

L. S. Williams,
Correspondent

Membership Report of the A. E. S.

Elections

ADELAIDE BRANCH: Robert G. Stone

ALLENTOWN - READING BRANCH: Robert G. Humphrey

BOSTON BRANCH: R. L. Helgeson, Lester F. Pope, Stephen H. Swift, Louis A. Tanner

BRIDGEPORT BRANCH: Harold Landsman, Gustav B. Soracco, Floyd C. Tatum

CHICAGO BRANCH: Sanford M. Linink, Frank J. McNally, Alfred K. Nelson, Werner M. Neuckranz, Oscar Pierremont, Roy M. Stage, Howard C. Warren

CLEVELAND BRANCH: Harold E. Hombehn, Elmer E. Larson, A. H. Losey

DAYTON BRANCH: Rayman A. Coy, Ray McDaniel, Lewis E. Michael, Edward G. Ribbin, Howard W. Vandeman

DETROIT BRANCH: Louis Balogh, H. B. Barnes, C. B. Black, K. B. Branion, Dean Clark, Clinton B. Clear, W. F. Clemons, Edward S. Coe, Frank J. Drawe, A. J. Emmerich, W. C. Enright, R. T. Hendrich, F. G. Jennings, C. Louis Keller, F. T. Konefke, W. Landback, B. E. Locke, L. McCoy, C. R. Petoskey, W. D. Putnam, J. C. Reha, M. Schuster, Sam Sgriccia, C. L. Sherman, Dalton J. V. Snyder, Jr., J. E. Woodison, Frederick D. Wressell, S. P. Zalewski

GRAND RAPIDS BRANCH: Edwin L. Graf, Howard F. Johnson, James A. Maclam, Tim E. O'Callaghan

JACKSON-LANSING BRANCH: Peter Des Camp, Donald D. Clark

LOS ANGELES BRANCH: Michael Katich, W. G. Luitjens, Jack C. Stone

MILWAUKEE BRANCH: Josef Deswysen, Frank L. Strand

NEWARK BRANCH: Elmer I. Huppert, Jr., Anthony T. Leshnick, Henry B. Linford, John R. Palumbo, Arthur J. Seuffert

PHILADELPHIA BRANCH: Cuthbert C. Becker, Dennis L. Cataldi, Ervin R. Honeyard, Steve J. Lewicki, Loren W. McComber, Philip Persemperi, Eugene Sullivan

ROCHESTER BRANCH: James Bauerschmidt, Samuel Bommatei, John J. Cipolla, Michael A. Furfaro, W. E. Hawley, Clement G. Hilberer, John R. McGuire, John R. Plotter, Herman Strassman

ROCKFORD BRANCH: Herman F. Rewerts. Elected in error—Adolf B. Gork

(Continued on page 408)

MEMBERSHIP CHART

	Membership May 1, 1948*	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
DETROIT	407	58	+50½	+12.4
CLEVELAND	190	17	+16	+ 8.4
GRAND RAPIDS	148	14	+10½	+ 7.1
LOS ANGELES	234	20	+15	+ 6.4
TORONTO	143	9	+ 7½	+ 5.2
BRIDGEPORT	154	23	+ 5	+ 3.2
NEW YORK	270	11	− 6	− 2.2
NEWARK	280	17	−11	− 3.9
WATERBURY	128	6	− 5½	− 4.3
PITTSBURGH	149	15	− 9½	− 6.4
BOSTON	163	13	−12	− 7.4
PHILADELPHIA	205	22	−19½	− 9.5
HARTFORD	150	8	−17½	−11.7
CHICAGO	445	30	−56½	−12.7
SECOND GROUP				
SYDNEY	91	26	+20	+22.0
MILWAUKEE	124	13	+10	+ 8.1
CINCINNATI	80	9	+ 6	+ 7.5
DAYTON	90	12	+ 5½	+ 6.1
ST. LOUIS	103	6	+ 4½	+ 4.4
INDIANAPOLIS	103	6	+ 4	+ 3.9
NEW HAVEN	110	10	+ 2½	+ 2.3
ROCHESTER	120	22	+ 1	+ 0.8
TWIN CITY	77	5	− 2	− 2.6
PROV.-ATTLEBORO	117	6	− 7½	− 6.4
SAN FRANCISCO	77		− 5	− 6.5
ST. JOSEPH VALLEY	98	7	− 7	− 7.1
BALTIMORE-WASH.	96	6	−12½	−13.1
BUFFALO	94	9	−13½	−14.4
THIRD GROUP				
SAGINAW VALLEY	38	14	+21	+55.3
LANCASTER	46	13	+12	+26.1
MELBOURNE	68	17	+14	+20.6
ADELAIDE	65	16	+10	+15.4
JACKSON-LANSING	64	11	+ 7½	+11.7
LOUISVILLE	18	3	+ 2	+11.1
MONTREAL	63	7	+ 5½	+ 8.7
SYRACUSE	66	13	+ 4½	+ 6.8
COLUMBUS	38	7	+ ½	+ 1.3
TOLEDO	73	3	− 1½	− 2.1
ROCKFORD	59	9	− 4	− 6.8
SPRINGFIELD	56	3	− 6½	−11.6
SOUTHEASTERN	49	4	−12	−24.5
OTHERS	114	52†	+51½	+45.2
TOTAL A. E. S.	5,263	573	+83	+ 1.6
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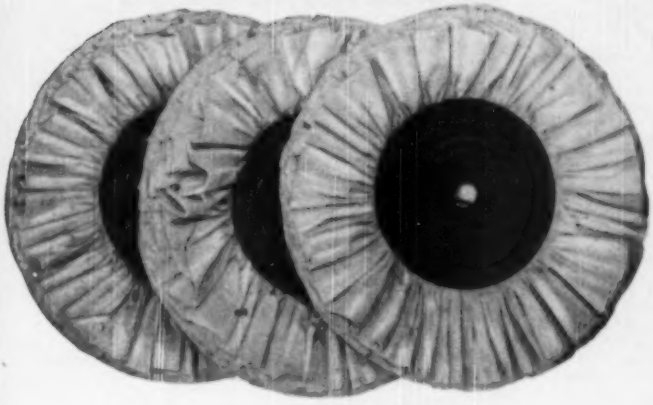

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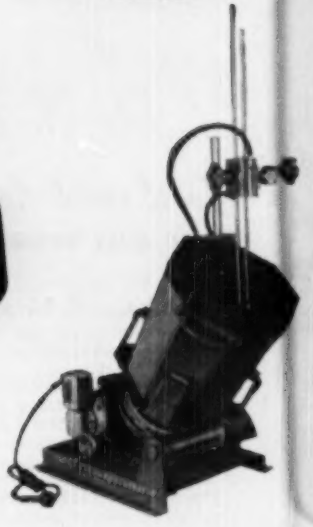

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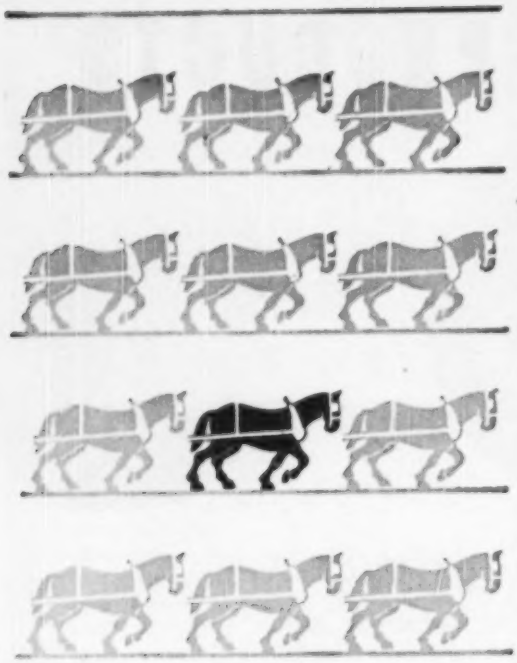

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(*Continued from page 347*)

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3 man-hours	4.50
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Conclusions

In conclusion, the hot electrolytic method of destroying copper cyanide solution presents to the plater the following advantages over other methods:

1. Complete destruction of the cyanide without formation of other toxic material
2. No sludge-disposal problem is created
3. Low equipment cost—allows utilization of available equipment
4. Low operating cost
5. Reclamation of the metal is possible, important in the cases of more expensive metals
6. The plater has a tool with which he is already familiar and can use without outside help

Although we have not tried the process on any other type of cyanide solution, it is without doubt applicable.

Literature Cited

[1]M. L. Riehl, "Analytical Procedures for the Determination of Metals Affecting Sewage Treatment", Sewage Works J. **20**, (4) 629–639 (1948).

[2]C. J. Wernlund and M. J. Zunick, U. S. Patent 2,194,438 (1940).

[3]J. G. Dobson, "Disposal of Cyanide Wastes", Metal Finishing **45**, 2–3 (1947).

[4]M. R. Thompson, "The Constitution and Properties of Cyanide Plating Baths", Trans. Electrochem. Soc. **79**, 417–437 (1941).

[5]G. N. Washburn, "The Toxicity to Warm-Water Fishes of Certain Cyanide Plating and Carburizing Salts Before and After Treatment by the Alkali-Chlorination Method", Sewage Works J. **20**, (6) 1074–1083 (1948).

[6]C. Schout, "The Fish Catastrophe During Drought", J. Am. Water Works Assn. **31**, 771–882 (1939).

[7]Private communication from Dr. C. F. Gurnham.

[8]Private communication.

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Plating

April 1, 1949

Dear Reader--

Most of us think of advertising as something the manufacturer does for his own benefit, but have you ever thought of it as a service rendered to the industry?

Without it, the work of the sellers' salesmen would be infinitely more difficult and time consuming, and sales costs would skyrocket, adding much to the cost of the goods.

Without it, also, you would not get information about new processes, equipment and materials, because no magazine could exist without advertising income.

Truly our modern machine age depends on advertising.

Invention or design and manufacture are two essential steps, but they lead to nowhere unless the third step is taken, sale. And sale is at least partially, and sometimes entirely, information which is best accomplished by advertising.

The advertiser and his message, therefore, require your thoughtful attention. Read the advertisements to learn where your needs can best be filled and who has that new thing which will further improve the efficiency of your operations.

Sincerely,

Gustaf Soderberg

Editor.

Future Meetings

Rockford Branch, A. E. S. Annual Meeting and Banquet on April 2 in Faust Hotel. Educational Session in the afternoon.

Indianapolis Branch, A. E. S. Annual Meeting on April 9 in Indianapolis Athletic Club. Educational Session at 1:00 P. M., Banquet in the evening.

Boston Branch, A. E. S. 14th Annual Banquet and Technical Session in Hotel Statler on Saturday, April 16.

Tenth Annual New England Regional Meeting in Hotel Kimball, Springfield, Mass., on Saturday, April 30. Educational Session at 2:00 P. M., Banquet in the evening.

The Electrochemical Society Spring Meeting in Benjamin Franklin Hotel, Philadelphia, Pa., on May 4 to 7.

Buffalo Branch, A. E. S. Regional Meeting in Hotel Markeen, Buffalo, N. Y., on May 7. Educational Session in the afternoon, Banquet in the evening.

Instrument Society of America Spring Meeting in Royal York Hotel, Toronto, Canada, May 12 to 13.

American Electroplaters' Society Annual Convention in Hotel Schroeder, Milwaukee, Wis., on June 27 to 30.

A. S. T. M. Fifty-second Annual Meeting in Chalfonte-Haddon Hall, Atlantic City, N. J., on June 27 to July 1.

USE

HARRISON 4A COMPOUNDS

for

BUFFING AND POLISHING

1923–1949

HIGH QUALITY—LOW COST

After 26 years of experience, Harrison & Company, Inc. is producing a complete line of Compounds for some of the leading manufacturers in 27 states and 2 foreign countries. THIS is PROOF of QUALITY and the PRICE is ALWAYS RIGHT. Let our practical representative help you.

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HAVERHILL, MASSACHUSETTS

ROCHELTEX

(Registered U.S. Pat. Office)

COPPER ADDITION AGENT

New Copper Addition Agent especially developed for faster, uniform, more economical copper plating.

Reduces or entirely eliminates carbonate buildup thereby eliminating the sewerage disposal problem of dumping a portion of the copper solution or giving it a chemical treatment.

Cuts cyanide consumption considerably, usually by 50%.

Increases cathode efficiencies by 20% thereby decreasing plating time or increasing thickness for a given plating time.

Can be added to any cyanide copper plating solution in any type of equipment.

Special formula for barrel copper plating available; this results in greater speed of deposit, fewer chemical additions, denser, smoother, more lustrous deposits.

Copper deposit is more uniform, finer grained, smoother, and brighter, therefore any metal plated over this surface is improved in appearance.

Provides an excellent stopoff for carburizing. Easy to buff and flows readily into base metal defects.

Send For Free Data Sheets

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STU KRENTEL

Technical Sales Representative

495 TERRACE STREET

ALTADENDA, CALIFORNIA

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WRITE TODAY FOR NEW TECHNICAL DATA SHEET GIVING FULL OPERATING INSTRUCTIONS.

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COMPOUNDS AND EQUIPMENT FOR EVERY METAL FINISHING PROBLEM

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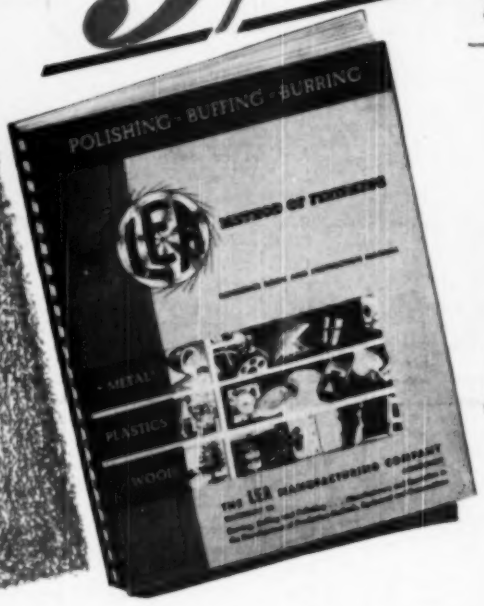

This "textbook" on finishing, based on the accumulated experience of twenty-five years of a constantly broadening service in the technique of finishing, is probably the most comprehensive work on the subject of finishing ever compiled. Comprising 162 well-illustrated and documented pages, it is packed full of useful information and suggestions for improving finishes and reducing finishing costs. It covers the various finishing steps with all commercially used metals, the various plastics and many woods and is divided into three sections (1) Finishing Methods; (2) Actual Case Histories; and (3) Finishing Materials.

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